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OBSERVATIONS

OF THE

SPOTS ON THE SUN

FROM NOVEMBER 9, 1853, TO MARCH 24, 1861,

MADE AT REDHILL,

BY

RICHARD CHRISTOPHER CARRINGTON, F.R.S.

ILLUSTRATED BY 166 PLATES

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SECTION I.

INTRODUCTION

OBSERVATIONS OF THE SOLAR SPOTS DURING SEVEN YEARS AND A HALF, MADE AT REDHILL, FROM 1853 TO 1861, BY R. C. CARRINGTON, ESQ.

THE observations herein contained are less extensive than was originally intended, still it may be worth while to give a short account of what was designed to be done, and how the design has been modified by circumstances. The observatory which I built at Redhill in the summer and autumn of 1852 was specially arranged and fitted for meridian observations of Circumpolar Stars, as stated in the Preface to my Catalogue of Stars published in 1857. While superintending the progress of the buildings and kept for a time from access to instruments, I was led into a study of some series of drawings of the Sun's disk in the possession of the Royal Astronomical Society, and following on the subject, as one of great physical interest and of increasing importance, was much impressed with the capricious manner in which observations of the solar phenomena had commonly been taken up and laid aside again, the entire neglect of the subject by the public establishments, grave defects in the methods of observation commonly employed, and as might be expected, large discrepancies in the results of previous observers in respect of the Elements of Position of the Pole and Period of Rotation. At the same time it will be remembered, on comparison of dates, that the publication of the Cosmos of Baron v. Humboldt had reached that part in which he collects into one view the state of our knowledge of "The Sun considered as the Central Body," and in which, for the first time, due prominence was accorded by one of those minds to which the world defers to the results of observation of the Hofrath Schwabe of Dessau. It was at the same time, or nearly thereabouts, that with some trouble I procured a copy of Professor Rudolph Wolf's "Neue Untersuchungen uber die Periode der Sonnenflecken und ihre Bedeutung," in which, (though priority is due to General Sabine,) the parallel is pointed out between the recent periodic variation of Solar spot frequency, and a certain periodicity in terrestrial magnetism, and a first endeavour made to retrace the maxima and minima of past periods. That the Solar phenomena, amid the universal subjection to order and law, should alone be subject to caprice could never gravely be entertained by any mind of philosophic training, but till the time of the appearance of the works above referred to, the attempts of several able men had tended to increase a very general conviction that time and labour would be thrown away on such a subject, and that beyond the limitation of the appearances to certain zones on the Sun, there was nothing to indicate law or the

illustrations, but which is destructive of their value when used as data for founding elements upon

3 Partiality in observations The selection of large or special objects from motives of fancy and not fair samples of the whole disk

4 Observations of differences from one limb only, requiring the assumption of the diameter, a method which the experienced will unite in condemning as needlessly faulty, while the inexperienced will protest he sees no objection to it

5 Measurements so made (I instance Pastorf's, though with all respect for himself) that their reduction for any purpose whatever would be attended with vastly more trouble and less profit than commencing anew

6 The attempt to determine the direction of the meridian crossing the disk by running the image with telescope fixed after setting down the positions either on a previously drawn circle or obtaining a photograph I fear the noxious influence of this notion more than any other, for while other faults are readily seen and put aside this has a semblance of accuracy and may still come to destroy the value of many a future record It is not so easy to procure a "conviction" in this case, for condemnation will only be agreed on by those who have gone through much labour of reduction with disappointment in the result I have known several persons who have accumulated observations untested by reduction continue to practise this process, when a few hours spent in discussing their record would convince them of the necessity of changing their method of observation

I pass over many more obvious defects depriving records of all scientific value, such as drawings by mere estimation on a scale of less than two inches to the diameter, although they are frequently forced upon our notice

In the next place I will briefly refer to the discrepancies I have alluded to in the same paragraph I found matters were little mended since 1776, in which M Lalande in his first memoir gave a table of "Authors who have determined the position of the Solar Equator" and their results These results, though many are respectable, might be considered as superseded by the more modern determinations of Laugier, Bohm, Petersen, Kysæus, Bianchi, and others, but still the results stood thus

Date	Observer	No of Series	Rot	I	N	For
1842	Laugier	29	$25^d\ 34$	$7^\circ\ 9'$	$75^\circ\ 8'$	1840
1852	Bohm	13	25 52	6 57	76 47	1833
1841	Petersen	1		6 51	73 29	1841
	,,	5	Diff values			
1846	Kysæus	3	25 09	6 38	76 38	1841

I may perhaps pass over some other determinations, but the above are sufficient to show the state of the subject. It is desirable in passing them in review that notice be taken of the very undue prominence of supposed value given to the Elements of Petersen (which are quoted from Astron Nachrichten, No 418, Vol 18, p 168) and which are

based on the eight observations of one spot denoted in his paper by the letter *b* It is only to be explained by the circumstance that in this case the details and theory were simultaneously published, and that the observations and treatment were conducted by one in whose ability confidence was placed If the spots were absolutely fixed points on the Sun, the single series discussed as it was would have given an undoubtedly good result for a single series, but it implied a total forgetfulness of their variability of form and motion for this result to have been so often in after years quoted with evidently high importance attached to it The result of Kysaus is quoted from his Essay, "Ueber die Axendrehung der Sonne von Rudolf Kysaus, Siegen, 1846," in which numerous but not convenient formulæ will be found, and in which three of Peterson's observations (including his spot *b*) are taken for data The result is therefore of more weight than Peterson's own, although it happens to be in each element further from the truth Dr Bohm's Memoir is elaborate and the details of his observations and processes are given I find no particular fault with it, but at the same time I attach no particular weight to the results M Laugier's unpublished Memoir, so far as I could judge from the report on it by the referees given in the Comptes Rendus of 1843, was of much higher value, and I still hold it to be a matter of much regret that he should have delayed the publication in the hope of improving his results, till the probability has become very small after the lapse of twenty years that the public will ever be further benefited by it To M Laugier's results I attached by far my principal confidence on account of the number of series on which they are based and the known skill of the Astronomer I did not adopt his results absolutely as my provisional elements, but although I forget at this time the exact reasons by which I was led to use slightly different elements, it is now curious to see that I even then guessed rightly the directions in which they required correction, for I was led to slightly increase his value of the Inclination and diminish his longitude of the Node While the position of the Solar Equator was thus still affected with an unknown amount of error, the very ideas respecting the Period of Rotation were at fault I shall here give in illustration a passage from the letter of Bianchi to Schumacher, of May 27, 1843 (See Astron Nachr 483)

"If I may be allowed, I will, before closing my letter, put in a little claim I have to priority on a third subject A short time since I read in the journals the Notice of the Report made to the Academy of Sciences of Paris, by M Arago, on a work of M Laugier, the object of which is to fix with certainty the period of Solar Rotation by means of observations of the Spots The learned Secretary and Reporter concluded, and I think very justly, that the calculations and results of M Laugier were the best hitherto obtained in this branch of research And without doubt it must be interesting to see how, in the original memoir of this young Astronomer, he has ascertained and established the existence of proper motions among the spots he observed. Nevertheless, I have to remark that in the year 1817 I observed at Milan a Solar Spot of long duration, from which, by the means of a number of values which presented a good mutual accordance,

I obtained, as the time of the sidereal or *absolute* rotation of the Sun 25 325 days, a result which differs very slightly from that of Laugier My paper, containing the determination and considerations naturally connected therewith, appeared in the published correspondence of the Baron de Zach (see Vol V pages 409—427, and pages 521—539) In my calculations I assumed that the spot had no movement of its own, which was indicated very simply by the invariable size and figure which this spot presented during three or four successive appearances Now, if M Laugier and I thus agree in the amount of the Rotation we must conclude that the Solar Spots are of two kinds, those which notably change their place on the Sun's surface* and those which remain constantly at the same place"

It will be remarked that in this passage from the writings of an experienced Astronomer, there was still not the smallest suspicion that the differences of period observed were systematic, or that they depended in any way on the latitude of the particular spots, or that the times of Rotation of the general body of the Sun and of its fluid surface were different, for he speaks of the absolute Rotation of the Sun as determined from suitable observations of a single spot as a possibility, and this is after the researches of Laugier on the subject It will be seen that Petersen, in the Memoir I have referred to, contents himself with showing that his five spots give discordant values, and Kysaus, repeating his reductions, simply remarks that the mean of three spots gives one value with a certain probable error, and the mean of two of them a certain other value Dr Bohm, and in short all others, leave the subject in the same state Views of increasing clearness are however expressed in an admirable little paper by Dr C H F Peters, now of Clinton, New York, published in an early Volume of the Transactions of the American Association for the Advancement of Science, entitled "Contributions to the Atmospherology of the Sun," in which he draws his materials from observations of some extent made by himself at Naples in 1845, but which have remained unpublished, probably from the difficulty of procuring admission into any Transactions of the necessary number of illustrations I quote a few sentences from this paper, remarking that I did not receive it from the author till my own researches had made considerable progress

"The first fact, now, which offers itself, in comparing the heliographic places of one and the same spot for different days, is that the spots are not invariably attached to the Sun's surface but have *proper motion*" "Whenever in nature a motion is observed, inducement is given to research of laws and of forces causing it"

"A general proper motion of the spots towards the Equator (so he infers) being recognized, the question is raised naturally Have they any motion also in longitude? and in what sense (direction) to the East or to the West? The solution of this question is intimately connected with the determination of the time of rotation For, it is clear, if all the spots had an *equal* proper motion in longitude, the time of the Sun's rotation, since it is deduced

* This remark reads strangely now, but it is a first doubt of Lalande's mountain peaks being a sufficient theory

from the spots would be wrong" "In other words, it is the time of rotation of the spots which results and not that of the Sun itself" "By means of this average value of the time of rotation, now, the successive places leave differences so significant that there can be no doubt of a very considerable motion parallel to the equator The displacements in longitude seem even far more considerable than those in latitude The annexed table B gives some examples Whether there be a common motion, and in what sense (direction) cannot be decided in the present state of our knowledge of the Sun's rotation"

So nearly did this able observer come to the term in latitude without obtaining it, and leave its actual determination to me I have great pleasure in referring to his very excellent remarks, and particularly in referring the reader to his description of the normal history of the process of development and reabsorption of a spot, in which his indications are much in advance of anything else which has appeared on the subject I do not intend in this place to write fully on the previous labours of others, especially when the treatment of the subject has been directed by different objects in view, but Dr Wilson of Glasgow, and Sir W Herschel, are two observers whose conclusions are necessarily involved directly or indirectly in every research subsequent to their own. I allude to Dr Wilson's Memoir in order to remark that, although I hold his general conclusion that the Solar maculæ are cavernous, or hollows in the general level of the luminous surface, his specific description and diagram conveys an impression which is somewhat erroneous Principally, that as a general description it is too precise, there is more variety in the appearances than he confesses to, and there are marked departures from his description of form, which is rather one specific type out of several which might be adduced, and will be familiar to every one when photography has furnished us with forms on which all, whether observers or not, may rely Sir W Herschel's theory of the section of a spot, or rather Sir John's modification and improvement upon it, requires, in my opinion, reconsideration, particularly since the discovery by Mr Dawes of what I may momentarily term the doubly black nucleus The necessity of this reconsideration will be felt on the one hand when due attention is bestowed on its capability of application throughout their duration to the more complicated, as well as to normal simple spots, and on the other hand, when the motion in longitude depending on the latitude as now established is considered, at the same time that the constant relation of nucleus and penumbra is remembered I do not pretend to have finally formed opinions on the theory of the spot section, and I find it certainly more easy to frame objections in this matter than to remove them, but I think a certain degree of attention is desirable to the views of Professor Secchi, as published in the Washington Observations I will add that Schwabe's remark must in any case be borne in mind—that the depth of the cavity in some instances is much less than in others, and is certainly variable Laugier has remarked (in a private letter to me) that the so regarded black ground of the nucleus frequently appeared to him under high powers, when the atmosphere admitted of their application, as an assemblage of dark points with little interstices, and there was general

evidence to his mind of a sort of porosity, he even says resolvability, using the term as applied to the nebulæ As I have not regarded these points of physical interest within the scope of my researches, I leave them at this point to succeeding observers as matters for consideration It suffices for my present purpose that a simple spot is a cavity of which the nucleus may be regarded as the shallow bottom, offering a tolerable definite centre as a point of observation

I pass on to the conditions I proposed to comply with in the method to be adopted —

1 On any day of observation every spot visible and observable with the telescope was to be observed and drawn, without preference to small or great
2 The observations of position to admit of great rapidity, in order to be a match to the unfavourable climate in which they were to be made, and therefore the necessity of any adjustment of the telescope to be evaded
3 The system to be such as admitted of brief and orderly record, in a form obviously intelligible at any future time, and admitting of a uniform and invariable process of reduction with as few figures as possible
4 The system of observation at the same time to be of a high degree of accuracy, without which the great labour necessarily involved would not be adequately compensated
5 The method to be as far as possible applicable with any ordinary telescope without special appliances, in order to be available by others

I may not state the whole, for considerations of this kind are of the nature of prophecy after the event, and do not occur at the time in so orderly a form One method is thought of and tried, and found to have objections of one sort, and then another, and another, till the observer finds he is satisfied, and cannot further improve on himself The method I have pursued did not occur at once in its final form, but grew out of a somewhat rude notion of making the disk of the sun its own circular micrometer, and the process of reduction was successively improved, and more than one volume commenced and put in the fire, as means of shortening and simplifying the process came into view by practice and trial Firstly, I decided on observing the disk by projecting it on a screen placed at some distance from the eye-piece of the telescope The telescope used was my Equatorial by Simms, of 4 5 inches aperture, and 52 inches focal length, possessing a large and flat field, from having been constructed for a comet seeker, and armed with a positive eye piece of power 25 There is nothing new so far, the very arrangement being to be seen in the earliest work of the Sun, that by Scheiner, "Rosa Ursina" (p 349), in which the idea is attributed to Gruenberger, and is again found to be employed by Hevelius, and delineated by him in his Selenography In the focus of the telescope, however, I placed two bars of flattened gold wire, at right angles to each other (very nearly), and turned *approximately* into the position of being inclined 45 degrees on each side of a meridian, or parallel of declination The independence of

the result of the bars being exactly placed, is the feature of principal importance, as doing away with the necessity of preliminary adjustment, and the telescope being by this means always ready for use, without the loss of a moment The image of the Solar disk, and the cross bars in focus, was projected on a screen provided with a support to hold it in any desired position, and brought out with distinctness by placing around the object glass a large collar, to throw the whole apparatus into shade The screen was of glass roughened and then coated with straw-coloured distemper (or colour mixed without oil), having a dull surface, trial of various tints leading to the adoption of a pale yellow, and glass not being liable to curl or buckle by the action of heat or moisture The image was first made to be from 12 to 14 inches diameter, but it being intended to record the appearances to a scale of 12 inches in the volume of reproduced disks, and it being found that in drawing and recopying the tendency was always to draw too large, the image was shortly reduced to 11 inches, to allow for unintentional exaggeration The telescope was held firmly in declination by a rod connecting the eye end and the lower end of the polar axis In Right ascension an ordinary good clamp maintained it in position, and generally immovably, but if wind caused any vibration it was sensibly felt in Right ascension only The image was of course seen to run along the screen from right to left, the true north limb being the upper limb on the screen, and contacts were in all cases observed at the eastern edge of each bar only In Fig 1 is shown the general arrangement, in Fig 2 the relative positions as projected on the screen, in Fig 3 the disk of the Sun in its natural position It is not to be inferred from the equality of the circles in Figs 2 and 3, that the field of view was equal or nearly equal to the Sun's disk its diameter was about four times that of the Sun

The observation consisted firstly of drawing every visible spot or group to the intended scale, and indicating the particular nuclei or points of the nuclei selected for observation To these, letters of the alphabet were assigned as names for the day, and then the order in which they arrived at each bar written down, before proceeding to note the time The disk was next adjusted by moving the telescope and finally clamping it in declination, so that the centre should pass a little above or a little below C, the intersection of the bars, the position of some spot or group nearly on the parallel of the centre commonly being the motive of the selection of position, there being no theoretical condition to comply with beyond that the centre of the disk should be within a moderate distance from C The disk was then screwed back by turning the R A handle of the instrument to such a position that it would take 10 or 15 seconds before the first contact of either limb with a bar would take place, and then the handle was gently released and a second taken from the Chronometer, while the minute vibration of the telescope in R A was ceasing of itself The times of contact with each bar were then observed and recorded for the Sun's advancing limb, each nucleus selected as before named, and Sun's retreating limb When the number of spots did not exceed 5 or 6, the contacts of both bars could commonly be observed with ease simultaneously, and in these cases three sets of passages were taken.

occasions found to lie between 2 and 5 minutes of arc The general effect of the omission will be to cause the deduced heliographical latitudes of all spots to come out too great by a small quantity which can never exceed $\frac{1}{2}\theta$, and which becomes zero at the middle of the spot's passage across the disk The omission in any case can, therefore, have had no sensible effect

With the calculated distances and position-angles of the points observed, and the drawings of detail of each group, the disk as observed was reproduced, and laid down for each day in a series of volumes on a scale of 12 inches to the diameter in all cases, and in any observatory which may be partially devoted to this subject, it will be desirable that a similar pictorial record on a not less scale, should be reproduced and preserved No more disks are included in the present plan among the illustrations, as their number forbids the contemplation of their being published An equivalent record in a more digested and easily comparable arrangement is given instead, which will find its explanation further on

I pass to the second stage of treatment, by which from relative positions on the disk are deduced the heliographical elements of each spot

Let (R) be the sun's semidiameter in minutes of arc, and let $\rho' = \frac{r}{R}$ (R) (see Fig 4) then will ρ, the angular distance at the Sun's centre of S from C, the apparent centre of the surface, or direction of the earth, be given by the relation

$$\frac{r}{R} = \sin(\rho + \rho'), \qquad \text{or } \rho = \sin^{-1}\frac{r}{R} - \rho'$$

since in the figure

$$\frac{O\sigma}{O\Sigma} = \frac{O\sigma}{OS} = \sin O S \sigma = \sin(S O E + S E O)$$

In Figure 5 let P be the position of the Sun's N Pole, C N (as before) the meridian through the apparent centre, S the spot, N D M the Solar Equator, N the ascending Node, and

N D M = L, the heliographical longitude of C, or of the Earth at the time

C M = D, the heliographical latitude of C

N C P = G + H, the angle G being the inclination of two planes passing through the line joining the centres of the Sun and Earth, and the poles of the Earth and Ecliptic respectively, and the angle H the inclination of two planes passing through the same line, and the poles of the Sun and the Ecliptic respectively

Also let l = N D the heliographical longitude of S reckoned along the Solar Equator from N

λ = D S the Spot's heliographical latitude

then in the triangle P S C are known

$$P C S = (A + a + \iota) + (G + H) = \chi \text{ suppose}$$
$$S C = \rho, \qquad \text{and} \qquad P C = 90 - D$$

therefore readily

$$\sin\lambda = \cos\rho \sin D + \sin\rho \cos D \cos\chi$$
$$\sin(L - l) = \sin\chi \sin\rho \operatorname{cosec}\lambda$$

which determine l and λ.

The auxiliary angles are readily deduced from Figure 6, in which N C is part of the ecliptic, N M the Solar Equator, N the ascending Node, C the direction of the Earth, K the pole of the Ecliptic, P the Pole of the Sun The known angles and sides are

$$M\,N\,C = I\,,\quad N\,C = 180° + \odot - N,\quad N\,M\,C = 90°$$

whence

$$\tan L = \cos I\ \tan(\odot - N)$$
$$\sin D = \sin I\ (\odot - N)$$
$$\tan H = \tan I\ \cos(\odot - N)$$

similarly $\tan G = \tan \omega\ \cos \odot$

Tables of these quantities for every degree of the arguments were computed with the provisional elements I=7° 10′ and N=74° 30′ for 1854 0, copies of which are appended to the Preface, from which the required values for each observation were found almost by interpolation at sight

I proceed to give a complete example of an observation and the process of reduction

On page 188 of my third manuscript volume of observations is found the following entry,

1860, August 9th, Thursday page 188

Observed by Mr von Bose

$10^{h}\ 16^{m}\ 0$ Chron $= 10^{h}\ 39^{m}\ 57^{s}\ 5$ Appleton (Clock) Bm $29^{in}\ 83$ Th $59^{\circ}\ 7$

(Then the sketches of each group)

	Bar A			Bar B		
O	9 48 20 0	9 56 20 0	10 4 20 0	O	9 52 20 0	10 0 20 1
P	48 50 8	56 50 7	4 50 5	P	53 24 9	1 24 6
Q	48 55 3	56 55 1	4 54 9	U	53 31 2	1 30 8*
R	48 58 9	56 58 9	4 58 8	Q	53 46 3	1 46 7
S	49 9 6	57 9 5	5 9 4	R	53 58 8	1 58 5
T	49 14 8	57 14 9	5 15 0	X	54 1 6	2 2 0*
U	49 15 8*	57 15 9	5 16 0*	W	54 2 8	2 2 7
V	49 43 3	57 43 2	5 43 1	ξ	54 8 4*	2 8 4*
W	50 0 6	58 0 8	6 0 5	S	54 10 0	2 10 1
X	50 21 4	58 21 2	6 21 0	T	54 26 2	2 26 7
ξ	50 29 6	58 29 2	6 29 4*	Y	54 29 0	2 29 1
Y	50 40 5	58 40 5	6 40 3	ζ	54 48 6	2 48 9
ζ	50 51 3	58 51 3	6 51 0	Z	54 57 1	2 57 2
Z	50 52 3	58 51 9	6 52 2	V	55 11 3	3 11 6
O	9 51 25 3	9 59 25 3	10 7 25 3	O	9 55 28 2	10 3 28 0
	+0 9	+1 2	−0 9		+1 9	−1 0

(The numbers in the last line are what it would be necessary to apply to the entered numbers above each, to reproduce the actual numbers of observation. An Asterisk

indicates that the number it is appended to was derived by differences with another nucleus, two or three passing too nearly together for both to be observed at the same time)

The advantage of entering the seconds slightly changed as above is that a faulty observation is at once detected, and that the means can be written down at sight

On the left hand or opposite page of the same volume, the means are entered in the following order, with the required correction to Redhill Sidereal times

1860 Aug 9

	A	B
O_1	9 56 20 000	9 56 20 05
P	56 20 667	57 24 75
Q	56 55 100	57 46 50
R	56 58 867	57 58 65
S	57 9 500	58 10 05
T	57 14 900	58 26 45
U	57 15 900	57 31 00
V	57 43 200	59 11 45
W	58 0 633	58 2 75
X	58 21 200	58 1 80
ζ	58 29 400	58 8 40
Y	58 40 433	58 29 05
ζ	58 51 200	58 48 75
Z	58 52 133	58 57 15
O_2	9 59 25 300	9 59 28 10
$\frac{1}{2}(O_1 + O_2)$	57 52 650	57 54 075

Add $24^m\ 49^s 0$

The Reduction as copied from the manuscript

The first part which follows is general for all the spots

B	9 57 54 1	O	137° 5′ 43″	$B_2 - B_1$	188s 050	2 27428
A	52 7	N	74 35 47	$A_2 - A_1$	185 300	2 26788
	9 57 53 4	O − N	62 29 56			0 00640
	+24 49 0					
	+− 41 3	G	−17° 37′ 8		A	45° 25′ 3
	10 23 23 6	H	+ 3 19 4			−14 21 3
	9 12 47 8	ι	− 29		A + G + H + ι	31 40
	1 11 GMT		−14 21 3		D	+6° 21′ 2
					L	242 18 8

The following part is special to the two spots selected for illustration (Refraction is neglected)

1860	Spot V		Spot W		Aug 9
$b-B$	+77 375	+1 88860	+ 8 675	+0 93827	Log $(b-B)$
$a-A$	− 9 450	−0 97543	+ 7 983	+0 90217	Log $(a-A)$
Log $(b-B)$	1 88860	−0 91317	0 93827	+0 03610	Diff
Log $(B_2-B_1$	2 27428	0 00640	2 27428	0 00640	Log tan A
Diff	9 61432	−0 90677	8 66399	+0 02970	Diff
Log cos a	0 00331	———	0 13617	———	———
Log 2	0 30103	(45 22 4)	0 30103	(45 22 4)	$(A+\iota)$
Log $\frac{r}{R}$	9 91866	97 3 9	9 10119	46 57 5	a
Log (R)	1 199	+31 4 0	1 199	+31 4 0	$A+G+H+\iota$
Log ρ'	1 118	128 7 9	0 300	78 1 5	χ
Log cos ρ	9 74982	56 1 0	9 99655	7 15 1	$\rho+\rho'$
Log sin D	+9 04399	13 1	+9 04399	2 0	ρ'
Log (1)	+8 79381	55 47 9	+9 04054	7 13 1	ρ
Log cos χ	−9 79061	+9 89575	+9 31699	+9 99044	Log sin χ
Log sin ρ	9 91754	9 91754	9 09917	9 09917	Log sin ρ
Log cos D	9 99733	0 04801	9 99733	0 00404	Log cosec λ
Log (2)	−9 70548	+9 86130	+8 41349	+9 09365	Log sin $(L-l)$
(1)	+ 06220	242 18 8	+ 10978	242 18 8	L
(2)	− 50755	+46 36 2	+ 02591	+7 7 6	$(L-l)$
Sum	− 44535	195 43	+ 13569	235 11	l
Log sin λ	−9 64870	−26 27	+9 13255	+7 48	λ

The whole of the observations without any exception were reduced in the above manner in books ruled on the right hand pages for 3 spots to a page and 2 columns for each spot * In the example I insert the symbols in place of the numbers for the third spot Taking out the natural number $\frac{r}{R}$ from the logarithms and adding together $(A+\iota)$ and a, the above give the following two lines in the Catalogue of Spots

No	Dist.	Pos	Hel Long	Hel Lat	Group
4286	8292	142° 26′	195° 43′	−26° 27′	790
4287	1262	92 20	235 11	+ 7 48	787

* It is curious to perceive in the first memoir of Lalande, that while intending the utmost brevity, he makes two steps of the latter part of the process, first computing the ecliptical longitude and latitude of the spot before passing finally to the heliographical It will be noticed also that he omits the correction ρ'

as they will there be found, and this ends the reduction For further comparison and discussion, it is convenient next to clear the heliographical longitude of rotation, at least approximately, and for this purpose a near mean value 25^d 380 was provisionally adopted from its admitting conveniently of much subdivision without remainders In Table 4 are given the epochs of the coincidence of the assumed prime meridian with the ascending Node of the Sun's Equator on this supposition of 25 38 mean solar days for the working period of rotation As the fractions of the day are throughout counted in civil time from the preceding midnight 1854—0^d 00 here signifies mean midnight on December 31st, 1853 In Table 5 are written, 1 the day and fraction from midnight of the observation, 2 the difference from the preceding epoch of Table 4, 3 this difference converted into rotation-angle in the proportion of 360° 25^d 38, or the angle through which the prime meridian had rotated since its last coincidence with Node The deduction of this amount for each day manifestly leaves us a heliographical longitude, reckoned in all cases from a prime meridian, which, if our period be correct, is constant, if incorrect, varies slowly with the time The correctness or incorrectness of the period in any small degree is of no consequence at this stage of calculation

I regard a catalogue of positions thus obtained as of little use without the corresponding figures of the spots, at the same time that it is impracticable to publish the disks singly as observed I adopted the following arrangement which I hope to see approved and followed in future records of the Sun Two features require to be illustrated, 1st the position of the group on the Sun in reference to the Equator and to the assumed prime meridian, 2nd the changes which each group is seen to undergo Accordingly, I formed and here give two series of illustrations 1st a series of Rotations as observed, in which each group appears once for all in its observed position in its most typical aspect, and in which the meridians passing through the centre of the disk are indicated for every day, and 2nd a series of plates in which each group observed more than once is fully shown by arranging the recorded figures of each day under one another in succession, from the top to the bottom of the page, the observation of the day when the group passed the centre of the disk occupying the middle square This series of illustrations shows most forcibly the devastation of the record by the badness of the climate, it being a rare event for a continuous series to be obtained The particular part of the nucleus of any spot which was observed, may always be found by comparison of these sheets with the Catalogue, and thus the reader is put in possession of all the information of the observer with the advantage of having it condensed and arranged for further inquiry

Between the first and second of these series of diagrams I have interposed three other sheets giving a condensed view of the distribution in latitude, which though shown in the series of Rotations is not there in a form which the eye can catch at sight In these plates the scale is materially changed by giving 1 inch vertical for 10 degrees of latitude, and $\frac{1}{2}$ inch horizontal for each rotation or 360 degrees of longitude The

immediate result of this examination, which was published some years since, was to show a great contraction of the limiting parallels between which spots were formed for two years previously to the minimum of 1856, and soon after this epoch the apparent commencement of two fresh belts of spots in high latitudes North and South, which have in the subsequent years shown a tendency to coalesce and ultimately to contract as before to extinction Whether this is what occurs at each period of increase and decrease of frequency of the Spots must be left to observers who may follow me to show At present it is only probable that such is the case, and another contribution made to the facts on the broad scale which will ultimately elucidate the origin of this phenomenon and instruct us on the question, "What is a Sun?"

Note —On the corrections required for Ellipticity of the Solar disk and for Refraction

1 In fig 7 let C D be drawn parallel to the minor axis of the elliptical disk and C D lying between C N and C A_2, let the angle N C D=D, then D C B_1=A+D and the angle which the major axis makes with Bar B=90°—(A+D)

If p_b denote the perpendicular from the centre of the disk on bar B at the instant of contact with bar B, and a and b are respectively the major and minor semiaxes, and $b^2=a^2(1-e^2)$, it is well known by the properties of the ellipse that

$$p_b = a\ (1 - e^2\ \sin^2\ \overline{A + D})^{\frac{1}{2}}$$

and if p_a is the similar perpendicular on bar A that

$$p_a = a\ (1 - e^2\ \cos^2\ \overline{A + D})^{\frac{1}{2}}$$

and in this case we must substitute for our previous equations the following

$$2\,p_b = 15\ \sin\ \delta\ F\ (B_2 - B_1)\ \sin\ A$$
$$2\,p_a = 15\ \sin\ \delta\ F\ (A_2 - A_1)\ \sin\ A$$

from which if we write

$$\tan\ A' = \frac{B_2 - B_1}{A_2 - A_1}$$

we deduce

$$\tan A' = \tan A\ (1 + \tfrac{1}{2}\ e^2\ \cos\ 2\ \overline{A + D})$$

and thence, forming tan (A'—A), lastly

$$A = A' + \frac{e^2}{4\ \sin\ 1''}\ \sin\ 2\ D$$

2 If the Sun's polar diameter is less than the equatorial diameter by one thousandth part, then

$$e^2 = \frac{1}{500}$$

and (G+H) being the angle before described, the correction for this assumed ellipticity will be

$$A - A' = +\ 103''\ \sin\ 2\ (G + H)$$

which will vary from +82″ to —82″ since 2 (G+H) varies from +53° to −53° (about)

The correction due to this circumstance is therefore negligible in daily computation, but may just affect elements of the Equator as it has a yearly period

3 The effect of Refraction may be traced with sufficient accuracy by following out the general consideration that all distances on the disk parallel to the vertical will be proportionably shortened, while those parallel to the horizon will be unaffected The angle D will in this case be the angle at the centre of the disk between the great circles drawn to the Pole and the Zenith, +S for E hour angles, and −S for West The correction will be of two kinds In the first place, the angle A or the deduced position of the bars will be affected, and secondly, the position angle and distance from centre of each spot

If we take as an approximate expression for the refraction at any Zenith distance

$$57''.5 \tan Z$$

we shall have as the relation of the axes of the disk

$$b = a\,(1 - k) \qquad \text{where } k = 57.5 \sin 1'' \sec^2 Z$$

Whence the correction of the position of the bars, or

$$A - A' = +28''.75 \sec^2 Z \sin 2S$$

and each spot further requires the correction

$$+ r\ k \cos (A + a + S) \text{ in distance from centre,}$$

and

$$- k \sin (A + a + S) \text{ in position angle}$$

Ex In spots V and W, August 9th, 1860, take $\theta = +5'$ (the full value), and the compression as above assumed

	Spot V		Spot W	
Uncorrected	8292	142° 26′	1262	92° 20′
Correction for θ	− 0001	− 1 9	+ 0001	− 0 2
„ Ellip	——	− 0 8	——	− 0 8
„ Refr	——	− 0 5	——	− 0 5
„ „	− 0002	− 1 2	+ 0000	− 1 5
Corrected	8289	142 22	1263	92 17

In remarking the total amount of the three corrections, it will be noticed that in the cases selected there happens a concurrence of negative signs

Quantities used in reducing Sun Spots

TABLE I

Δ ☉ = hourly increment of longitude, for interpolating ☉
ι = inclination of Sun's path to a parallel of Declination
Log (R) = Log semi-diameter in minutes of arc
N = 74° 30′ for 1854·0

Δ ☉	ι	Log (R)	Day	True Node 1854.	True Node 1855	True Node 1856
″	′			° ′ ″	° ′ ″	° ′ ″
153	+0 9	1 212	Jan 1	74 29 44	74 30 38	74 31 32
153	+1 6	1 212	11	29 46	30 40	31 34
153	+2 3	1 212	21	29 48	30 41	31 36
152	+2 8	1 211	31	29 50	30 43	31 38
152	+3 3	1 211	Feb 10	29 51	30 44	31 39
151	+3 5	1 210	20	29 52	30 46	31 41
150	+3 7	1 209	Mar 2	29 53	30 47	31 42
149	+3 8	1 207	12	29 54	30 48	31 43
149	+3 8	1 206	22	29 55	30 49	31 44
148	+3 7	1 205	Apr 1	29 57	30 50	31 45
147	+3 5	1 204	11	29 58	30 51	31 46
146	+3 3	1 203	21	29 59	30 53	31 48
145	+3 0	1 201	May 1	30 0	30 54	31 49
145	+2 6	1 200	11	30 2	30 55	31 51
144	+2 1	1 199	21	30 3	30 57	31 52
144	+1 5	1 199	31	30 5	30 59	31 54
143	+0 8	1 198	June 10	30 7	31 1	31 56
143	+0 1	1 198	20	30 9	31 3	31 58
143	−0 6	1 198	30	30 10	31 4	32 0
143	−1 3	1 198	July 10	30 12	31 6	32 2
143	−1 9	1 198	20	30 14	31 8	32 3
144	−2 5	1 199	30	30 16	31 10	32 5
144	−2 9	1 199	Aug 9	30 17	31 11	32 7
145	−3 2	1 200	19	30 19	31 13	32 8
145	−3 5	1 201	29	30 20	31 14	32 9
146	−3 6	1 202	Sept 8	30 21	31 15	32 11
147	−3 7	1 203	18	30 22	31 16	32 12
148	−3 7	1 204	28	30 23	31 17	32 13
149	−3 7	1 206	Oct 8	30 24	31 19	32 14
149	−3 5	1 207	18	30 25	31 20	32 15
150	−3 3	1 208	28	30 27	31 21	32 16
151	−2 9	1 209	Nov 7	30 28	31 22	32 18
151	−2 5	1 210	17	30 29	31 24	32 19
152	−1 9	1 211	27	30 31	31 26	32 21
152	−1 1	1 212	Dec 7	30 33	31 28	32 23
153	−0 3	1 212	17	30 35	31 29	32 25
153	+0 5	1 212	27	74 30 37	74 31 31	74 32 27

Quantities used in reducing Sun Spots

TABLE I —*continued*

True Node

At	1857	1858	1859	1860	1861
Jan 1	74° 32′ 28″	74° 33′ 24″	74° 34′ 20″	74° 35′ 14″	74° 36′ 8″
11	32 30	33 26	34 22	35 15	36 9
21	32 31	33 27	34 23	35 17	36 11
31	32 33	33 29	34 25	35 18	36 12
Feb 10	32 34	33 30	34 26	35 20	36 14
20	32 36	33 32	34 28	35 21	36 15
Mar 2	32 37	33 33	34 29	35 23	36 17
12	32 39	33 35	34 31	35 24	36 18
22	32 40	33 36	34 32	35 26	36 20
Apr 1	32 42	33 38	34 34	35 27	74 36 21
11	32 43	33 39	34 35	35 29	
21	32 45	33 41	34 37	35 30	
May 1	32 46	33 42	34 38	35 32	
11	32 48	33 44	34 40	35 33	
21	32 49	33 45	34 41	35 35	
31	32 51	33 47	34 43	35 36	
June 10	32 52	33 48	34 44	35 38	
20	32 54	33 50	34 46	35 39	
30	32 55	33 51	34 47	35 41	
July 10	32 57	33 53	34 49	35 42	
20	32 58	33 54	34 50	35 44	
30	33 0	33 56	34 52	35 45	
Aug 9	33 1	33 57	34 53	35 47	
19	33 3	33 59	34 55	35 48	
29	33 4	34 0	34 56	35 50	
Sept 8	33 6	34 2	34 58	35 51	1853
18	33 7	34 3	34 59	35 53	
28	33 9	34 5	35 1	35 54	74 29 29
Oct 8	33 10	34 6	35 2	35 56	29 30
18	33 12	34 8	35 4	35 57	29 32
28	33 13	34 9	35 5	35 58	29 33
Nov 7	33 15	34 11	35 7	36 0	29 35
17	33 16	34 12	35 8	36 1	29 36
27	33 18	34 14	35 10	36 3	29 38
Dec 7	33 19	34 15	35 11	36 4	29 39
17	33 21	34 17	35 13	36 6	29 41
27	74 33 22	74 34 18	74 35 14	74 36 7	74 29 42

In interpolating ☉ from the Naut Alm, 20″ was added for aberration

TABLE II

The Angle G

O	G	O	G	O	G	O	G
0°	+23° 27′ 6	45°	+17° 3′ 6	90°	0° 0′ 0	135°	−17° 3′ 6
1	+23 27 4	46	+16 46 6	91	− 0 26 0	136	−17 20 2
2	+23 26 9	47	+16 29 2	92	− 0 52 1	137	−17 36 5
3	+23 25 9	48	+16 11 5	93	− 1 18 1	138	−17 52 5
4	+23 24 6	49	+15 53 5	94	− 1 44 1	139	−18 8 1
5	+23 22 8	50	+15 35 2	95	− 2 10 0	140	−18 23 4
6	+23 20 7	51	+15 16 5	96	− 2 35 9	141	−18 38 3
7	+23 18 2	52	+14 57 5	97	− 3 1 7	142	−18 52 8
8	+23 15 4	53	+14 38 2	98	− 3 27 4	143	−19 7 0
9	+23 12 1	54	+14 18 6	99	− 3 53 0	144	−19 20 8
10	+23 8 5	55	+13 58 7	100	− 4 18 6	145	−19 34 2
11	+23 4 5	56	+13 38 5	101	− 4 44 0	146	−19 47 3
12	+23 0 1	57	+13 17 9	102	− 5 9 3	147	−20 0 0
13	+22 55 3	58	+12 57 1	103	− 5 34 5	148	−20 12 3
14	+22 50 1	59	+12 36 0	104	− 5 59 6	149	−20 24 3
15	+22 44 6	60	+12 14 6	105	− 6 24 5	150	−20 35 9
16	+22 38 7	61	+11 52 9	106	− 6 49 3	151	−20 47 1
17	+22 32 4	62	+11 31 0	107	− 7 13 9	152	−20 57 9
18	+22 25 7	63	+11 8 8	108	− 7 38 3	153	−21 8 4
19	+22 18 6	64	+10 46 3	109	− 8 2 5	154	−21 18 5
20	+22 11 1	65	+10 23 6	110	− 8 26 6	155	−21 28 3
21	+22 3 3	66	+10 0 7	111	− 8 50 4	156	−21 37 6
22	+21 55 1	67	+ 9 37 5	112	− 9 14 1	157	−21 46 6
23	+21 46 6	68	+ 9 14 1	113	− 9 37 5	158	−21 55 1
24	+21 37 6	69	+ 8 50 4	114	−10 0 7	159	−22 3 3
25	+21 28 3	70	+ 8 26 6	115	−10 23 6	160	−22 11 1
26	+21 18 5	71	+ 8 2 5	116	−10 46 3	161	−22 18 6
27	+21 8 4	72	+ 7 38 3	117	−11 8 8	162	−22 25 7
28	+20 57 9	73	+ 7 13 9	118	−11 31 0	163	−22 32 4
29	+20 47 1	74	+ 6 49 3	119	−11 52 9	164	−22 38 7
30	+20 35 9	75	+ 6 24 5	120	−12 14 6	165	−22 44 6
31	+20 24 3	76	+ 5 59 6	121	−12 36 0	166	−22 50 1
32	+20 12 3	77	+ 5 34 5	122	−12 57 1	167	−22 55 3
33	+20 0 0	78	+ 5 9 3	123	−13 17 9	168	−23 0 1
34	+19 47 3	79	+ 4 44 0	124	−13 38 5	169	−23 4 5
35	+19 34 2	80	+ 4 18 6	125	−13 58 7	170	−23 8 5
36	+19 20 8	81	+ 3 53 0	126	−14 18 6	171	−23 12 1
37	+19 7 0	82	+ 3 27 4	127	−14 38 2	172	−23 15 4
38	+18 52 8	83	+ 3 1 7	128	−14 57 5	173	−23 18 2
39	+18 38 3	84	+ 2 35 9	129	−15 16 5	174	−23 20 7
40	+18 23 4	85	+ 2 10 0	130	−15 35 2	175	−23 22 8
41	+18 8 1	86	+ 1 44 1	131	−15 53 5	176	−23 24 6
42	+17 52 5	87	+ 1 18 1	132	−16 11 5	177	−23 25 9
43	+17 36 5	88	+ 0 52 1	133	−16 29 2	178	−23 26 9
44	+17 20 2	89	+ 0 26 0	134	−16 46 6	179	−23 27 4
45	+17 3 6	90	0 0 0	135	−17 3 6	180	−23 27 6

TABLE II —*continued*

O	G	O	G	O	G	O	G
180°	−23° 27′ 6	225°	−17° 3′ 6	270°	0° 0′ 0	315°	+17° 3′ 6
181	−23 27 4	226	−16 46 6	271	+ 0 26 0	316	+17 20 2
182	−23 26 9	227	−16 29 2	272	+ 0 52 1	317	+17 36 5
183	−23 25 9	228	−16 11 5	273	+ 1 18 1	318	+17 52 5
184	−23 24 6	229	−15 53 5	274	+ 1 44 1	319	+18 8 1
185	−23 22 8	230	−15 35 2	275	+ 2 10 0	320	+18 23 4
186	−23 20 7	231	−15 16 5	276	+ 2 35 9	321	+18 38 3
187	−23 18 2	232	−14 57 5	277	+ 3 1 7	322	+18 52 8
188	−23 15 4	233	−14 38 2	278	+ 3 27 4	323	+19 7 0
189	−23 12 1	234	−14 18 6	279	+ 3 53 0	324	+19 20 8
190	−23 8 5	235	−13 58 7	280	+ 4 18 6	325	+19 34 2
191	−23 4 5	236	−13 38 5	281	+ 4 44 0	326	+19 47 3
192	−23 0 1	237	−13 17 9	282	+ 5 9 3	327	+20 0 0
193	−22 55 3	238	−12 57 1	283	+ 5 34 5	328	+20 12 3
194	−22 50 1	239	−12 36 0	284	+ 5 59 6	329	+20 24 3
195	−22 44 6	240	−12 14 6	285	+ 6 24 5	330	+20 35 9
196	−22 38 7	241	−11 52 9	286	+ 6 49 3	331	+20 47 1
197	−22 32 4	242	−11 31 0	287	+ 7 13 9	332	+20 57 9
198	−22 25 7	243	−11 8 8	288	+ 7 38 3	333	+21 8 4
199	−22 18 6	244	−10 46 3	289	+ 8 2 5	334	+21 18 5
200	−22 11 1	245	−10 23 6	290	+ 8 26 6	335	+21 28 3
201	−22 3 3	246	−10 0 7	291	+ 8 50 4	336	+21 37 6
202	−21 55 1	247	− 9 37 5	292	+ 9 14 1	337	+21 46 6
203	−21 46 6	248	− 9 14 1	293	+ 9 37 5	338	+21 55 1
204	−21 37 6	249	− 8 50 4	294	+10 0 7	339	+22 3 3
205	−21 28 3	250	− 8 26 6	295	+10 23 6	340	+22 11 1
206	−21 18 5	251	− 8 2 5	296	+10 46 3	341	+22 18 6
207	−21 8 4	252	− 7 38 3	297	+11 8 8	342	+22 25 7
208	−20 57 9	253	− 7 13 9	298	+11 31 0	343	+22 32 4
209	−20 47 1	254	− 6 49 3	299	+11 52 9	344	+22 38 7
210	−20 35 9	255	− 6 24 5	300	+12 14 6	345	+22 44 6
211	−20 24 3	256	− 5 59 6	301	+12 36 0	346	+22 50 1
212	−20 12 3	257	− 5 34 5	302	+12 57 1	347	+22 55 3
213	−20 0 0	258	− 5 9 3	303	+13 17 9	348	+23 0 1
214	−19 47 3	259	− 4 44 0	304	+13 38 5	349	+23 4 5
215	−19 34 2	260	− 4 18 6	305	+13 58 7	350	+23 8 5
216	−19 20 8	261	− 3 53 0	306	+14 18 6	351	+23 12 1
217	−19 7 0	262	− 3 27 4	307	+14 38 2	352	+23 15 4
218	−18 52 8	263	− 3 1 7	308	+14 57 5	353	+23 18 2
219	−18 38 3	264	− 2 35 9	309	+15 16 5	354	+23 20 7
220	−18 23 4	265	− 2 10 0	310	+15 35 2	355	+23 22 8
221	−18 8 1	266	− 1 44 1	311	+15 53 5	356	+23 24 6
222	−17 52 5	267	− 1 18 1	312	+16 11 5	357	+23 25 9
223	−17 36 5	268	− 0 52 1	313	+16 29 2	358	+23 26 9
224	−17 20 2	269	− 0 26 0	314	+16 46 6	359	+23 27 4
225	−17 3 6	270	0 0 0	315	+17 3 6	360	+23 27 6

TABLE III

The Angles H, D, *and* L

☉–N	H	D	L	☉–N	H	D	L
°	° ′	° ′	° ′	°	° ′	° ′	° ′
0	+7 10 0	0 0	180 0 0	45	+5 4 9	+5 3 7	224 46 5
1	+7 9 9	+0 7 5	180 59 5	46	+4 59 5	+5 8 9	225 46 5
2	+7 9 7	+0 15 0	181 59 0	47	+4 54 1	+5 14 1	226 46 5
3	+7 9 4	+0 22 4	182 58 6	48	+4 48 5	+5 19 2	227 46 5
4	+7 9 0	+0 29 9	183 58 1	49	+4 42 9	+5 24 2	228 46 6
5	+7 8 4	+0 37 4	184 57 7	50	+4 37 2	+5 29 1	229 46 7
6	+7 7 7	+0 44 9	185 57 2	51	+4 31 5	+5 33 8	230 46 8
7	+7 6 8	+0 52 3	186 56 7	52	+4 25 6	+5 38 5	231 46 9
8	+7 5 9	+0 59 7	187 56 2	53	+4 19 6	+5 43 1	232 47 0
9	+7 4 8	+1 7 1	188 55 8	54	+4 13 6	+5 47 6	233 47 1
10	+7 3 6	+1 14 5	189 55 4	55	+4 7 5	+5 51 9	234 47 3
11	+7 2 2	+1 21 8	190 55 0	56	+4 1 3	+5 56 1	235 47 4
12	+7 0 7	+1 29 2	191 54 5	57	+3 55 1	+6 0 3	236 47 6
13	+6 59 1	+1 36 5	192 54 1	58	+3 48 7	+6 4 4	237 47 8
14	+6 57 4	+1 43 8	193 53 7	59	+3 42 3	+6 8 3	238 48 1
15	+6 55 5	+1 51 0	194 53 3	60	+3 35 8	+6 12 2	239 48 3
16	+6 53 5	+1 58 2	195 52 9	61	+3 29 3	+6 15 9	240 48 5
17	+6 51 4	+2 5 4	196 52 5	62	+3 22 7	+6 19 5	241 48 7
18	+6 49 2	+2 12 6	197 52 1	63	+3 16 0	+6 22 9	242 49 0
19	+6 46 8	+2 19 7	198 51 7	64	+3 9 3	+6 26 3	243 49 3
20	+6 44 3	+2 26 8	199 51 3	65	+3 2 5	+6 29 5	244 49 6
21	+6 41 7	+2 33 8	200 51 0	66	+2 55 7	+6 32 7	245 49 9
22	+6 39 0	+2 40 7	201 50 6	67	+2 48 8	+6 35 7	246 50 3
23	+6 36 1	+2 47 6	202 50 3	68	+2 41 8	+6 38 6	247 50 6
24	+6 33 2	+2 54 5	203 50 0	69	+2 34 8	+6 41 3	248 50 9
25	+6 30 1	+3 1 3	204 49 7	70	+2 27 8	+6 44 0	249 51 3
26	+6 26 9	+3 8 1	205 49 4	71	+2 20 7	+6 46 5	250 51 7
27	+6 23 5	+3 14 8	206 49 1	72	+2 13 5	+6 48 9	251 52 0
28	+6 20 1	+3 21 5	207 48 8	73	+2 6 3	+6 51 1	252 52 4
29	+6 16 5	+3 28 1	208 48 6	74	+1 59 1	+6 53 3	253 52 8
30	+6 12 9	+3 34 6	209 48 3	75	+1 51 8	+6 55 3	254 53 2
31	+6 9 1	+3 41 1	210 48 1	76	+1 44 5	+6 57 2	255 53 6
32	+6 5 2	+3 47 5	211 47 9	77	+1 37 2	+6 58 9	256 54 1
33	+6 1 2	+3 53 8	212 47 7	78	+1 29 9	+7 0 6	257 54 5
34	+5 57 1	+4 0 0	213 47 5	79	+1 22 5	+7 2 1	258 54 9
35	+5 52 8	+4 6 2	214 47 4	80	+1 15 1	+7 3 5	259 55 3
36	+5 48 5	+4 12 3	215 47 2	81	+1 7 6	+7 4 7	260 55 8
37	+5 44 1	+4 18 3	216 47 0	82	+1 0 2	+7 5 8	261 56 2
38	+5 39 6	+4 24 3	217 46 9	83	+0 52 7	+7 6 8	262 56 7
39	+5 34 9	+4 30 2	218 46 8	84	+0 45 2	+7 7 6	263 57 2
40	+5 30 2	+4 36 0	219 46 7	85	+0 37 7	+7 8 3	264 57 7
41	+5 25 3	+4 41 7	220 46 6	86	+0 30 2	+7 8 9	265 58 1
42	+5 20 3	+4 47 3	221 46 6	87	+0 22 6	+7 9 4	266 58 6
43	+5 15 2	+4 52 9	222 46 6	88	+0 15 1	+7 9 7	267 59 0
44	+5 10 1	+4 58 3	223 46 5	89	+0 7 6	+7 9 9	268 59 5
45	+5 4 9	+5 3 7	224 46 5	90	0 0 0	+7 10 0	270 0 0

TABLE III — *continued*

O—N	II	D	L	O—N	II	D	L
90°	0° 00	+7° 100	270° 00	135°	−5° 49	+5° 37	315° 135
91	−0 76	+7 99	271 05	136	−5 101	+4 583	316 135
92	−0 151	+7 97	272 10	137	−5 152	+4 529	317 135
93	−0 226	+7 94	273 14	138	−5 203	+4 473	318 134
94	−0 302	+7 89	274 19	139	−5 253	+4 417	319 134
95	−0 377	+7 83	275 23	140	−5 302	+4 360	320 133
96	−0 452	+7 76	276 28	141	−5 349	+4 302	321 132
97	−0 527	+7 68	277 33	142	−5 396	+4 243	322 131
98	−1 02	+7 58	278 38	143	−5 441	+4 183	323 130
99	−1 76	+7 47	279 42	144	−5 485	+4 123	324 129
100	−1 151	+7 35	280 47	145	−5 528	+4 62	325 127
101	−1 225	+7 21	281 51	146	−5 571	+4 00	326 126
102	−1 299	+7 06	282 55	147	−6 12	+3 538	327 124
103	−1 372	+6 589	283 59	148	−6 52	+3 475	328 122
104	−1 445	+6 572	284 64	149	−6 91	+3 411	329 119
105	−1 518	+6 553	285 68	150	−6 129	+3 346	330 117
106	−1 591	+6 533	286 72	151	−6 165	+3 281	331 115
107	−2 63	+6 511	287 76	152	−6 201	+3 215	332 113
108	−2 135	+6 489	288 80	153	−6 235	+3 148	333 110
109	−2 207	+6 465	289 83	154	−6 269	+3 81	334 107
110	−2 278	+6 440	290 87	155	−6 301	+3 13	335 104
111	−2 348	+6 413	291 91	156	−6 332	+2 545	336 101
112	−2 418	+6 386	292 94	157	−6 361	+2 476	337 97
113	−2 488	+6 357	293 97	158	−6 390	+2 407	338 94
114	−2 557	+6 327	294 101	159	−6 417	+2 338	339 91
115	−3 25	+6 295	295 104	160	−6 443	+2 268	340 87
116	−3 93	+6 263	296 107	161	−6 468	+2 197	341 83
117	−3 160	+6 229	297 110	162	−6 492	+2 126	342 80
118	−3 227	+6 195	298 113	163	−6 514	+2 54	343 76
119	−3 293	+6 159	299 115	164	−6 535	+1 582	344 72
120	−3 358	+6 122	300 117	165	−6 555	+1 510	345 68
121	−3 423	+6 83	301 119	166	−6 574	+1 438	346 64
122	−3 487	+6 44	302 122	167	−6 591	+1 365	347 59
123	−3 551	+6 03	303 124	168	−7 07	+1 292	348 55
124	−4 13	+5 561	304 126	169	−7 22	+1 218	349 51
125	−4 75	+5 519	305 127	170	−7 36	+1 145	350 47
126	−4 136	+5 476	306 129	171	−7 48	+1 71	351 42
127	−4 196	+5 431	307 130	172	−7 59	+0 597	352 38
128	−4 256	+5 385	308 131	173	−7 68	+0 523	353 33
129	−4 315	+5 338	309 132	174	−7 77	+0 449	354 28
130	−4 372	+5 291	310 133	175	−7 84	+0 374	355 23
131	−4 429	+5 242	311 134	176	−7 90	+0 299	356 19
132	−4 485	+5 192	312 134	177	−7 94	+0 224	357 14
133	−4 541	+5 141	313 135	178	−7 97	+0 150	358 10
134	−4 595	+5 89	314 135	179	−7 99	+0 75	359 05
135	−5 49	+5 37	315 135	180	−7 100	0 00	360 00

TABLE III —*continued*

☉—N	H.	D	L	☉—N	H	D	L
°	° ′	° ′	° ′	°	° ′	° ′	° ′
180	−7 10 0	0 0 0	0 0 0	225	−5 4 9	−5 3 7	44 46 5
181	−7 9 9	−0 7 5	0 59 5	226	−4 59 5	−5 8 9	45 46 5
182	−7 9 7	−0 15 0	1 59 0	227	−4 54 1	−5 14 1	46 46 5
183	−7 9 4	−0 22 4	2 58 6	228	−4 48 5	−5 19 2	47 46 6
184	−7 9 0	−0 29 9	3 58 1	229	−4 42 9	−5 24 2	48 46 6
185	−7 8 4	−0 37 4	4 57 7	230	−4 37 2	−5 29 1	49 46 7
186	−7 7 7	−0 44 9	5 57 2	231	−4 31 5	−5 33 8	50 46 8
187	−7 6 8	−0 52 3	6 56 7	232	−4 25 6	−5 38 5	51 46 9
188	−7 5 9	−0 59 7	7 56 2	233	−4 19 6	−5 43 1	52 47 0
189	−7 4 8	−1 7 1	8 55 8	234	−4 13 6	−5 47 6	53 47 1
190	−7 3 6	−1 14 5	9 55 4	235	−4 7 5	−5 51 9	54 47 3
191	−7 2 2	−1 21 8	10 55 0	236	−4 1 3	−5 56 1	55 47 4
192	−7 0 7	−1 29 2	11 54 5	237	−3 55 1	−6 0 3	56 47 6
193	−6 59 1	−1 36 5	12 54 1	238	−3 48 7	−6 4 4	57 47 8
194	−6 57 4	−1 43 8	13 53 7	239	−3 42 3	−6 8 3	58 48 1
195	−6 55 5	−1 51 0	14 53 3	240	−3 35 8	−6 12 2	59 48 3
196	−6 53 5	−1 58 2	15 52 9	241	−3 29 3	−6 15 9	60 48 5
197	−6 51 4	−2 5 4	16 52 5	242	−3 22 7	−6 19 5	61 48 7
198	−6 49 2	−2 12 6	17 52 1	243	−3 16 0	−6 22 9	62 49 0
199	−6 46 8	−2 19 7	18 51 7	244	−3 9 3	−6 26 3	63 49 3
200	−6 44 3	−2 26 8	19 51 3	245	−3 2 5	−6 29 5	64 49 6
201	−6 41 7	−2 33 8	20 51 0	246	−2 55 7	−6 32 7	65 49 9
202	−6 39 0	−2 40 7	21 50 6	247	−2 48 8	−6 35 7	66 50 3
203	−6 36 1	−2 47 6	22 50 3	248	−2 41 8	−6 38 6	67 50 6
204	−6 33 2	−2 54 5	23 50 0	249	−2 34 8	−6 41 3	68 50 9
205	−6 30 1	−3 1 3	24 49 7	250	−2 27 8	−6 44 0	69 51 3
206	−6 26 9	−3 8 1	25 49 4	251	−2 20 7	−6 46 5	70 51 7
207	−6 23 5	−3 14 8	26 49 1	252	−2 13 5	−6 48 9	71 52 0
208	−6 20 1	−3 21 5	27 48 8	253	−2 6 3	−6 51 1	72 52 4
209	−6 16 5	−3 28 1	28 48 6	254	−1 59 1	−6 53 3	73 52 8
210	−6 12 9	−3 34 6	29 48 3	255	−1 51 8	−6 55 3	74 53 2
211	−6 9 1	−3 41 1	30 48 1	256	−1 44 5	−6 57 2	75 53 6
212	−6 5 2	−3 47 5	31 47 9	257	−1 37 2	−6 58 9	76 54 1
213	−6 1 2	−3 53 8	32 47 7	258	−1 29 9	−7 0 6	77 54 5
214	−5 57 1	−4 0 0	33 47 5	259	−1 22 5	−7 2 1	78 54 9
215	−5 52 8	−4 6 2	34 47 4	260	−1 15 1	−7 3 5	79 55 3
216	−5 48 5	−4 12 3	35 47 2	261	−1 7 6	−7 4 7	80 55 8
217	−5 44 1	−4 18 3	36 47 0	262	−1 0 2	−7 5 8	81 56 2
218	−5 39 6	−4 24 3	37 46 9	263	−0 52 7	−7 6 8	82 56 7
219	−5 34 9	−4 30 2	38 46 8	264	−0 45 2	−7 7 6	83 57 2
220	−5 30 2	−4 36 0	39 46 7	265	−0 37 7	−7 8 3	84 57 7
221	−5 25 3	−4 41 7	40 46 6	266	−0 30 2	−7 8 9	85 58 1
222	−5 20 3	−4 47 3	41 46 6	267	−0 22 6	−7 9 4	86 58 6
223	−5 15 2	−4 52 9	42 46 5	268	−0 15 1	−7 9 7	87 59 0
224	−5 10 1	−4 58 3	43 46 5	269	−0 7 6	−7 9 9	88 59 5
225	−5 4 9	−5 3 7	44 46 5	270	0 0 0	−7 10 0	90 0 0

TABLE III —*continued*

O—N	H	D	L	O—N	H	D	L
°	° ′	° ′	° ′	°	° ′	° ′	° ′
270	0 00	−7 10 0	90 00	315	+5 49	−5 37	135 13 5
271	+0 76	−7 99	91 05	316	+5 101	−4 583	136 13 5
272	+0 151	−7 97	92 10	317	+5 152	−4 529	137 13 5
273	+0 226	−7 94	93 14	318	+5 203	−4 473	138 13 4
274	+0 302	−7 89	94 19	319	+5 253	−4 417	139 13 4
275	+0 377	−7 83	95 23	320	+5 302	−4 360	140 13 3
276	+0 452	−7 76	96 28	321	+5 349	−4 302	141 13 2
277	+0 527	−7 68	97 33	322	+5 396	−4 243	142 13 1
278	+1 02	−7 58	98 38	323	+5 441	−4 183	143 13 0
279	+1 76	−7 47	99 42	324	+5 485	−4 123	144 12 9
280	+1 151	−7 35	100 47	325	+5 528	−4 62	145 12 7
281	+1 225	−7 21	101 51	326	+5 571	−4 00	146 12 6
282	+1 299	−7 06	102 55	327	+6 12	−3 538	147 12 4
283	+1 372	−6 589	103 59	328	+6 52	−3 475	148 12 2
284	+1 445	−6 572	104 64	329	+6 91	−3 411	149 11 9
285	+1 518	−6 553	105 68	330	+6 129	−3 346	150 11 7
286	+1 591	−6 533	106 72	331	+6 165	−3 281	151 11 5
287	+2 63	−6 511	107 76	332	+6 201	−3 215	152 11 3
288	+2 135	−6 489	108 80	333	+6 235	−3 148	153 11 0
289	+2 207	−6 465	109 83	334	+6 269	−3 81	154 10 7
290	+2 278	−6 440	110 87	335	+6 301	−3 13	155 10 4
291	+2 348	−6 413	111 91	336	+6 332	−2 545	156 10 1
292	+2 418	−6 386	112 94	337	+6 361	−2 476	157 97
293	+2 488	−6 357	113 97	338	+6 390	−2 407	158 94
294	+2 557	−6 327	114 101	339	+6 417	−2 338	159 91
295	+3 25	−6 295	115 104	340	+6 443	−2 268	160 87
296	+3 93	−6 263	116 107	341	+6 468	−2 197	161 83
297	+3 160	−6 229	117 110	342	+6 492	−2 126	162 80
298	+3 227	−6 195	118 113	343	+6 514	−2 54	163 76
299	+3 293	−6 159	119 115	344	+6 535	−1 582	164 72
300	+3 358	−6 122	120 117	345	+6 555	−1 510	165 68
301	+3 423	−6 83	121 119	346	+6 574	−1 438	166 64
302	+3 487	−6 44	122 122	347	+6 591	−1 365	167 59
303	+3 551	−6 03	123 124	348	+7 07	−1 292	168 55
304	+4 13	−5 561	124 126	349	+7 22	−1 218	169 51
305	+4 75	−5 519	125 127	350	+7 36	−1 145	170 47
306	+4 136	−5 476	126 129	351	+7 48	−1 71	171 42
307	+4 196	−5 431	127 130	352	+7 59	−0 597	172 38
308	+4 256	−5 385	128 131	353	+7 68	−0 523	173 33
309	+4 315	−5 338	129 132	354	+7 77	−0 449	174 28
310	+4 372	−5 291	130 133	355	+7 84	−0 374	175 23
311	+4 429	−5 242	131 134	356	+7 90	−0 299	176 19
312	+4 485	−5 192	132 134	357	+7 94	−0 224	177 14
313	+4 541	−5 141	133 135	358	+7 97	−0 150	178 10
314	+4 595	−5 89	134 135	359	+7 99	−0 75	179 05
315	+5 49	−5 37	135 135	360	+7 100	0 00	180 00

TABLE IV

Epochs of coincidence of prime meridian with the Ascending Node of the Sun's Equator, taking 25 38 mean Solar days as a working period

1853	1855	1856	1857	1858	1860
d.	d.	d.	d	d.	d.
288 86	15 70	107 54	198 38	290 22	17 06
314 24	41 08	132 92	223 76	315 60	42 44
339 62	66 46	158 30	249 14	340 98	67 82
1854	91 84	183 68	274 52	1859	93 20
0 00	117 22	209 06	299 90	1 36	118 58
25 38	142 60	234 44	325 28	26 74	143 96
50 76	167 98	259 82	350 66	52 12	169 34
76 14	193 36	285 20	1858	77 50	194 72
101 52	218 74	310 58	11 04	102 88	220 10
126 90	244 12	335 96	36 42	128 26	245 48
152 28	269 50	361 34	61 80	153 64	270 86
177 66	294 88	1857	87 18	179 02	296 24
203 04	320 26	20 72	112 56	204 40	321 62
228 42	345 64	46 10	137 94	229 78	347 00
253 80	1856	71 48	163 32	255 16	1861
279 18	6 02	96 86	188 70	280 54	6 38
304 56	31 40	122 24	214 08	305 92	31 76
329 94	56 78	147 62	239 46	331 30	57 14
355 32	82 16	173 00	264 84	356 68	82 52

TABLE V

Angles to subtract from computed Longitude to refer the Solar spots to assumed prime meridian

1853	Less Epoch	Subtract	1854	Less Epoch	Subtract
d.	d	° ′	d	d	° ′
312 489	23 629	335 10	7 535	7 535	106 53
320 453	6 213	88 7	12 496	12 496	177 15
324 488	10 248	145 22	18 506	18 506	262 30
497	257	29	20 576	20 576	291 52
326 472	12 232	172 56	32 567	7 187	101 57
328 552	14 312	203 0	34 508	9 128	129 28
334 498	20 258	287 21	40 460	15 080	213 54
335 484	21 244	301 20	42 496	17 116	242 47
341 599	1 979	28 4	43 573	18 193	258 3
342 491	2 871	40 43	44 485	19 105	271 0
345 567	5 947	84 21	46 516	21 136	299 49
347 492	7 872	111 39	48 549	23 169	328 38
349 507	9 887	140 14	51 496	0 736	10 26
352 558	12 938	183 31	59 509	8 749	124 6
359 487	19 867	281 49	67 574	16 814	238 30
361 481	21 861	310 5			
362 541	22 921	325 7			
364 517	24 897	353 9			

The above is a sufficient specimen of this Table

SECTION II.

DEDUCED POSITIONS OF THE NUCLEI OBSERVED

The dates are in all cases inserted on which the Sun was found to be free of Spots In the years 1855 and 1856 the blanks in the record from this cause are very numerous The contents of the different columns are explained in the Introduction

1853	Day	No.	Dist.	Pos	Fr Node	II Long	II Lat.	Group
				° ′	° ′	° ′	° ′	
Nov 9	312 489	0001	8971	108 41	269 1	293 51	+ 5 12	1
17	320 453	2	6970	294 56	24 44	296 37	+ 4 38	1
		3	1601	33 5	338 43	250 36	+11 20	2
21	324 488	4	8609	303 36	43 31	258 9	+13 6	2
		5	7678	306 1	33 50	248 28	+13 50	2
	497	6	8498	301 13	42 29	257 0	+10 58	2
		7	7844	302 59	35 43	250 14	+11 44	2
23	326 472	8	6793	118 39	304 41	131 45	− 5 25	3
		9	7501	116 28	298 43	125 47	− 4 37	3
25	328 552	0010	2341	136 20	336 57	133 57	− 4 58	3
		1	4335	79 40	325 54	122 54	+13 8	4
Dec 1	334 498	2	3234	261 10	11 58	84 37	− 7 7	5
		3	2304	249 33	5 33	78 12	− 7 10	5
2	335 484	4	5351	272 8	27 17	85 57	− 6 37	5
		5	4287	268 15	20 3	78 43	− 6 47	5
		6	9645	120 8	282 0	340 40	−13 57	6
8	341 599	7	2806	236 19	13 17	345 13	−11 58	6
		8	2327	206 43	5 13	337 9	−13 15	6
		9	3173	152 52	349 52	321 48	−14 13	6
		0020	9746	92 59	285 24	257 20	+ 9 39	7
9	342 491	1	4340	254 16	25 47	345 4	−12 10	6
		2	2689	263 14	17 34	336 51	− 9 26	6
		3	8936	89 36	300 28	259 45	+11 22	7
		4	9059	91 42	298 38	257 55	+ 9 39	7
		5	9354	90 22	294 20	253 37	+11 15	7
12	345 567	6	4213	70 31	344 22	260 1	+11 40	7
		7	5027	76 31	338 20	253 59	+11 25	7
14	347 492	8	2227	351 40	12 5	260 26	+11 8	7
		9	1929	0 6	9 55	258 16	+ 9 54	7
		0030	3334	138 27	352 23	240 44	−12 46	8
		1	5976	80 56	333 5	221 26	+10 36	9

1854	Day	No	Dist.	Pos	Ft Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Dec 16	349 507	0032	5108	301 29	38 34	258 20	+ 9 55	7
		3	2211	17 12	8 13	227 59	+11 21	9
		4	2560	43 23	1 38	221 24	+10 58	9
19	352 558	5	8767	291 34	73 4	249 33	+11 1	7
		6	6727	297 39	53 12	229 41	+11 47	9
		7	5609	301 15	44 37	221 6	+11 21	9
		8	5872	295 40	47 23	223 52	+ 8 53	9
26	359 487	9	2576	13 39	17 43	95 54	+12 12	11
28	361 481	0040	4736	304 1	46 37	96 32	+11 18	11
		1	5668	267 38	56 25	106 20	− 5 40	10
		2	5198	266 12	53 10	103 5	− 6 13	10
		3	2456	293 15	35 25	85 20	+ 2 3	12
29	362 541	4	7636	269 9	72 48	107 41	− 4 55	10
		5	6847	266 31	66 10	101 3	− 6 38	10
		6	6500	294 59	61 3	95 56	+11 40	11
		7	8046	103 50	329 54	4 47	−10 13	13
31	364 517	8	9285	265 40	93 19	100 10	− 7 15	10
		9	3990	110 41	2 40	9 31	−10 3	13
1854		0050	7580	105 39	336 25	343 16	−12 7	14
Jan 8	7 535	1	9000	257 2	97 27	350 34	−11 53	14
		2	5644	69 46	0 50	253 57	+ 7 0	15
		3	6469	73 16	354 31	247 38	+ 6 35	15
13	12 496	4	5890	282 47	72 44	255 29	+ 6 6	15
		5	5132	289 49	66 30	249 15	+ 8 0	15
19	18 506	6	3455	73 2	24 39	122 9	− 1 16	16
		7	3457	75 8	24 31	122 1	− 1 59	16
		8	4244	94 50	19 39	117 9	− 9 28	17
		9	4404	95 2	18 38	116 8	− 9 42	17
21	20 576	0060	1565	287 4	54 41	122 49	− 1 25	16
22		1						
23		2						
25		3						
26		4						
28		5						
Feb 2	32 567	6	3431	46 6	41 42	299 45	+ 4 16	19
		7	4420	51 58	35 11	293 14	+ 5 9	19
		8	9631	81 58	344 8	242 11	− 6 20	20
4	34 508	9	7816	276 47	108 57	339 29	+11 41	18
		0070	2377	308 39	69 5	299 37	+ 4 36	19
		1	2166	316 34	66 54	297 26	+ 4 34	19
		2	1897	330 2	63 47	294 19	+ 4 12	19
		3	2060	336 28	62 46	293 18	+ 5 24	19
		4	7387	76 31	13 9	243 41	− 4 23	20
		5	7656	78 40	10 42	241 14	− 5 50	20
10	40 460	6	6399	261 14	106 3	252 9	− 0 32	20
		7	5828	262 28	101 51	247 57	− 0 32	20
		8	4974	252 32	96 41	242 47	− 6 29	20
		9	5140	264 10	97 4	243 10	− 0 32	20
		0080	3760	93 53	45 34	191 40	−13 27	21
		1	4466	95 4	41 19	187 25	−15 8	21
12	42 496	2	9189	255 23	135 19	252 32	− 0 48	20
		3	8168	257 47	123 10	240 23	− 0 17	20
		4	1693	207 52	75 50	193 3	−13 32	21

1854.	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Feb 12		0085	5510	74 22	35 22	152 35	− 6 9	22
		6	5891	76 48	32 39	149 52	− 7 26	22
13	43 573	7	9435	254 44	140 17	242 14	− 0 37	20
		8	3022	72 45	52 20	154 17	− 6 22	22
		9	3524	70 24	49 20	151 17	− 5 24	22
		0090	3794	75 49	47 36	149 33	− 7 19	22
14	44 485	1	0821	63 46	66 14	155 14	− 6 2	22
		2	1351	61 15	63 17	152 17	− 5 12	22
		3	1813	78 20	60 26	149 26	− 7 41	22
		4	2621	71 35	55 40	144 40	− 6 15	22
		5	3025	74 36	53 14	142 14	− 7 3	22
16	46 516	6	4026	253 5	96 42	156 53	− 5 50	22
		7	3846	255 38	95 30	155 41	− 4 56	22
		8	3309	254 19	92 15	152 26	− 5 42	22
		9	2845	249 2	89 31	149 42	− 7 24	22
		0100	2757	244 35	88 55	149 6	− 8 37	22
		1	2740	249 54	88 58	149 9	− 7 10	22
		2	2629	243 22	88 8	148 19	− 8 52	22
18	48 549	3	8058	247 35	128 55	160 17	− 7 7	22
		4	6722	246 25	117 26	148 48	− 8 25	22
21	51 496	5	2236	85 5	65 22	54 56	−10 4	23
		6	2512	82 41	63 38	53 12	− 9 50	23
23		7						
25		8						
26		9						
27		0110						
28		1						
Mar 1	59 509	2	9264	262 8	151 48	27 42	+ 9 59	24
		3	9126	263 56	149 27	25 21	+11 9	24
4		4						
5		5						
6		6						
9	67 574	7	3782	22 13	78 24	199 54	+ 8 21	25
		8	3725	27 20	77 23	198 53	+ 6 41	25
11	69 500	9	3306	291 57	109 31	203 42	+ 6 45	25
		0120	3048	313 43	102 53	197 4	+ 9 13	25
		1	5788	69 10	60 40	154 51	− 7 36	26
		2	6377	67 58	56 26	150 37	− 6 42	26
		3	6823	67 27	53 2	147 13	− 6 10	26
12	70 518	4	5132	271 9	124 54	204 39	+ 6 20	25
		5	4329	284 46	117 3	196 48	+ 9 2	25
		6	4361	66 2	71 17	151 2	− 6 28	26
13	71 532	7	6823	262 34	139 5	204 27	+ 6 3	25
		8	5990	272 2	131 3	196 25	+ 9 26	25
		9	0276	80 47	96 41	162 3	− 7 30	26
	538	0130	6004	271 40	131 14	196 31	+ 9 16	25
		1	2081	63 49	86 12	151 29	− 6 33	26
17	75 481	2	4443	312 32	112 24	121 45	+17 14	27
		3	3967	312 16	111 16	120 37	+14 26	27
		4	4003	318 7	109 6	118 27	+15 27	27
		5	4001	333 14	102 56	112 17	+16 27	27
		6	9491	56 34	31 47	41 8	+ 5 45	29
		7	9855	54 5	23 37	32 58	+ 9 30	29

1854	Day	No	Dist.	Pos	Fi Node	H Long	H. Lat.	Group
				° ′	° ′	° ′	° ′	
Mar 21	79 596	0138	9451	266 10	173 24	124 23	+17 48	27
		9	8568	268 46	160 43	111 42	+16 37	27
		0140	3407	23 54	91 17	42 16	+ 6 7	29
		1	4735	30 36	82 58	33 57	+ 8 57	29
22	80 514	2	3318	9 53	96 1	33 58	+ 8 54	29
26	84 569	3	8343	240 54	167 57	48 24	− 6 19	28
		4	7946	239 45	164 4	44 31	− 7 28	28
		5	7120	263 18	153 54	34 21	+ 8 39	29
27	85 510	6	8999	239 1	176 36	43 41	− 7 21	28
		7	8333	258 28	166 34	33 39	+ 8 11	29
28		8						
31	89 556	9	9849	57 43	37 5	206 47	+ 4 44	31
April 1	90 587	0150	9187	55 36	51 33	206 38	+ 4 49	31
		1	9666	51 52	43 46	198 51	+ 9 39	31
2	91 560	2	8125	53 25	65 4	206 21	+ 4 30	31
		3	8922	50 0	57 0	198 17	+ 9 8	31
5	94 550	4	3011	27 28	107 5	205 57	+ 4 13	31
		5	4501	29 15	99 8	198 0	+ 8 58	31
		6	7851	35 3	74 55	173 47	+17 47	32
6	95 570	7	1818	337 56	121 21	205 45	+ 4 19	31
		8	2976	4 7	113 23	197 47	+ 8 47	31
		9	6588	26 39	88 37	173 1	+18 13	32
		0160	6278	72 53	83 14	167 38	−10 33	33
8	97 508	1	4529	264 39	149 0	205 55	+ 3 56	31
		2	4365	353 2	115 18	172 13	+18 20	32
		3	8264	35 55	73 36	130 31	+18 48	34
	519	4	7695	268 6	170 12	226 57	+14 29	30
		5	3877	295 33	138 8	194 53	+11 56	31
		6	3566	301 6	135 17	192 2	+11 36	31
		7	3656	294 22	137 37	194 22	+10 36	31
		8	3863	284 54	141 5	197 50	+ 9 2	31
		9	3470	299 15	135 30	192 15	+10 45	31
		0170	4523	264 25	149 1	205 46	+ 3 49	31
21	110 555	1	2939	219 47	152 35	24 26	−11 44	35
		2	6108	43 43	101 41	333 32	+ 8 24	36
24	113 459	3	8109	233 36	193 47	24 26	−11 44	35
		4	2298	319 55	143 2	333 41	+ 8 8	36
29	118 540	5	8431	47 52	89 26	208 1	+12 24	37
May 2	121 566	6	3682	16 19	133 27	209 7	+12 29	37
		7	3780	19 9	132 15	207 55	+12 13	37
		8	8634	41 5	91 44	167 24	+19 10	38
4	123 536	9	3052	296 44	160 45	208 28	+ 9 56	37
		0180	6063	27 31	119 34	167 17	+19 8	38
9	128 551	1	6536	283 6	188 28	165 3	+19 41	38
		2	2064	346 40	152 20	128 55	+ 8 35	39
		3	2465	5 41	147 29	124 4	+ 9 23	39
		4	7465	50 27	107 54	84 29	+10 28	40
		5	7934	51 46	103 30	80 5	+10 26	40
		6	7640	53 35	105 51	82 26	+ 8 30	40
10	129 562	7	2412	309 42	161 47	124 1	+ 9 14	39
		8	5833	45 11	122 9	84 23	+10 22	40
		9	6478	47 33	117 10	79 24	+10 31	40
		0190	9404	76 20	85 7	47 21	− 9 5	41

1854	Day	No	Dist	Pos	Fr Node	II Long	II Lat.	Group
				° ′	° ′	° ′	° ′	
May 12	131 524	0191	2389	3 42	151 8	85 33	+ 9 37	40
		2	3052	20 22	145 8	79 33	+10 17	40
		3	6848	78 6	114 13	48 38	− 8 46	41
		4	7610	81 59	108 8	42 33	−12 13	41
14	133 543	5	4185	279 26	180 22	86 8	+ 9 52	40
		6	3283	290 11	173 26	79 12	+ 9 59	40
		7	3043	88 7	142 14	48 0	− 8 13	41
		8	3883	88 58	137 23	43 9	−10 4	41
16	135 526	9	7526	262 44	208 28	86 7	+ 8 25	40
		0200	1907	219 19	170 28	48 7	− 7 47	41
		1	1761	173 52	163 30	41 9	−12 7	41
17	136 542	2	3657	225 38	181 40	44 54	−10 37	41
		3	3297	224 55	179 31	42 45	−10 2	41
		4	3211	216 33	177 47	41 1	−12 12	41
20	139 505	5	8247	236 57	219 37	40 49	−12 14	41
	520	6	8345	236 56	220 39	41 39	−12 21	41
23	142 538	7	9277	234 54	234 59	13 10	−15 56	42
		8	8906	233 20	229 31	7 42	−16 49	42
24		9						
26		0210						
28	147 555	1	2262	288 2	183 7	250 8	+ 6 27	43
30		2						
31	150 520	3	2126	333 56	177 27	202 24	+11 25	44
		4	2240	354 56	172 48	197 45	+12 4	44
June 1	151 505	5	3538	289 18	193 20	204 20	+11 6	44
		6	2848	307 11	186 20	197 20	+12 32	44
4	154 551	7	8712	269 8	238 43	206 30	+11 29	44
		8	7783	272 24	228 44	196 31	+12 43	44
		9	3258	40 35	163 24	131 11	+10 40	45
		0220	6117	60 7	142 33	110 20	+ 9 24	46
10	160 547	1	3487	278 23	203 55	86 39	+ 7 26	47
13	163 598	2	7522	79 38	139 2	338 30	+ 0 33	48
14		3						
17	167 555	4	4341	65 25	166 32	309 52	+ 8 3	49
22	172 590	5	8139	71 38	142 10	214 5	+10 45	50
		6	9268	99 59	129 48	201 43	−14 28	51
23	173 517	7	6714	70 39	155 34	214 20	+10 23	50
		8	8289	103 17	143 18	202 4	−14 43	51
24	174 531	9	4919	67 17	169 33	213 56	+10 13	50
		0230	6921	108 43	157 26	201 49	−14 52	51
25	175 542	1	2911	55 22	184 4	214 6	+10 26	50
		2	5355	118 1	171 27	201 29	−14 56	51
	545	3	7412	104 26	153 26	183 26	−12 46	51
26	176 509	4	1436	9 48	197 46	214 6	+10 24	50
		5	3826	135 24	185 15	201 35	−14 39	51
27	177 520	6	2407	300 30	212 21	214 20	+10 22	50
		7	2983	171 10	199 26	201 25	−14 40	51
		8	3744	128 7	184 28	186 27	−12 7	51
28	178 510	9	4366	284 40	226 32	214 29	+10 22	50
		0240	3585	208 16	213 6	201 3	−14 59	51
	559	1	4461	283 56	227 15	214 30	+10 13	50
		2	3609	209 44	213 40	200 55	−14 48	51
29	179 536	3	6385	279 10	241 50	215 13	+10 8	50

1854.	Day	No	Dist.	Pos	Fi Nodo	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
June 29		0244	5001	230 49	228 23	201 46	−14 25	51
30	180 542	5	7959	277 31	256 6	215 13	+10 4	50
		6	6605	241 6	241 21	200 28	−14 27	51
	572	7	8012	277 59	256 37	215 20	+10 28	50
		8	6621	241 57	241 43	200 26	−13 59	51
July 2	182 563	9	9105	251 22	269 17	199 45	−13 41	51
4	184 512	0250	2820	220 28	218 22	121 11	− 8 54	52
16		1						
17		2						
18	198 567	3	8834	77 44	158 54	222 21	+17 35	55
19	199 522	4	3008	258 15	238 20	288 14	− 0 32	54
		5	6998	74 43	178 29	228 23	+17 55	55
		6	7775	76 56	171 21	221 15	+17 27	55
20	200 563	7	4925	67 42	195 45	230 54	+17 50	55
		8	5463	71 27	191 30	226 39	+17 17	55
		9	6101	74 47	186 37	221 46	+17 17	55
21	201 560	0260	3084	50 42	210 41	231 41	+17 33	55
		1	3973	64 58	203 4	224 4	+16 35	55
	565	2	3063	50 46	210 46	231 41	+17 27	55
		3	3669	59 24	205 53	226 48	+17 27	55
22	202 520	4	2271	5 21	224 57	232 19	+18 7	55
		5	2367	28 30	219 22	226 44	+17 41	55
		6	7545	83 9	175 50	183 12	+13 39	56
23	203 516	7	3078	324 21	238 13	231 28	+17 58	55
		8	2534	336 40	233 17	226 32	+17 37	55
		9	5886	80 46	190 10	183 25	+13 49	56
24	204 499	0270	4754	306 25	252 21	231 39	+17 50	55
		1	3958	311 59	246 28	225 46	+17 43	55
25	205 515	2	6406	299 17	266 4	230 58	+17 27	55
		3	5627	301 19	260 6	225 0	+17 12	55
27	207 615	4	9152	295 55	295 58	231 4	+17 36	55
29	209 565	5	9318	114 45	164 42	72 9	−11 40	57
		6	9557	111 5	159 55	67 22	− 8 58	57
30	210 518	7	8314	118 12	178 37	72 33	−11 30	57
		8	8787	113 54	172 35	66 31	− 9 7	57
Aug 1	212 496	9	5303	133 17	207 2	72 54	−11 12	57
		0280	5887	125 56	201 30	67 22	− 9 25	57
2	213 549	1	3702	152 34	221 30	72 26	−10 57	57
	558	2	3699	153 50	221 54	72 43	−11 14	57
		3	4146	141 44	216 30	67 19	− 9 54	57
6	217 587	4	6855	259 47	278 46	72 26	−10 56	57
		5	6256	258 41	274 14	67 54	− 9 53	57
7	218 517	6	8171	265 31	292 3	72 31	−10 42	57
8	219 525	7	9189	269 29	305 34	71 44	−10 26	57
		8	9784	98 23	162 30	288 40	+ 6 32	58
10	221 504	9	7872	101 8	190 43	288 49	+ 6 33	58
11	222 537	0290	6164	102 40	205 39	289 6	+ 6 25	58
13	224 503	1	2072	107 7	233 43	289 17	+ 6 4	58
	547	2	1962	107 31	234 24	289 20	+ 6 2	58
14	225 494	3	0222	265 46	247 51	289 21	+ 6 9	58
16	227 574	4	4784	286 27	277 16	289 16	+ 5 48	58
18	229 612	5	8240	289 41	306 15	289 20	+ 5 50	58
19	230 470	6	9188	290 58	318 25	289 20	+ 5 50	58

1854	Day	No	Dist	Pos	Fi Node	II Long	II Lat	Group
				° ′	° ′	° ′	° ′	
Aug 20	231 502	0297	9846	292 33	333 44	290 1	+ 5 49	58
22		8						
24		9						
25	236 508	0300	9399	123 2	189 24	74 41	−10 14	59
26	237 535	1	8445	126 44	203 23	74 5	−10 20	59
27	238 564	2	7022	132 9	218 10	74 17	−10 3	59
		3	6796	104 37	216 18	72 25	+ 8 48	60
		4	7029	106 32	214 29	70 36	+ 7 26	60
28	239 528	5	5481	141 24	231 56	74 22	−10 13	59
		6	4894	107 13	230 51	73 17	+ 7 38	60
		7	5313	107 28	228 3	70 29	+ 7 27	60
29	240 526	8	3912	159 58	246 19	74 36	−10 23	59
		9	3290	109 17	241 58	70 15	+ 7 5	60
30	241 522	0310	3031	195 9	260 29	74 38	−10 23	59
31	242 546	1	3611	235 23	275 6	74 44	−10 19	59
Sept 1	243 517	2	5033	256 34	288 54	74 45	−10 8	59
		3	8302	108 51	207 52	353 43	+ 6 0	61
4	246 525	4	2870	115 8	250 25	353 37	+ 5 58	61
		5	9786	107 44	188 40	291 52	+ 5 39	63
6	248 519	6	7686	107 3	218 31	293 26	+ 8 45	63
		7	7957	110 31	216 11	291 6	+ 5 54	63
7	249 513	8	5919	108 25	233 33	294 22	+ 8 18	63
		9	6392	111 43	230 11	291 0	+ 6 8	63
8	250 563	0320	3821	109 3	248 30	294 25	+ 8 6	63
		1	4614	116 50	243 40	289 35	+ 4 34	63
		2	7380	130 25	225 57	271 52	− 7 45	64
10	252 531	3	0131	244 43	273 28	291 28	+ 6 36	63
		4	3881	156 33	256 26	274 26	− 8 30	64
		5	4517	146 7	250 33	268 33	− 7 30	64
	540	6	0707	303 23	276 59	294 51	+ 7 51	63
		7	3897	156 52	256 27	274 19	− 8 39	64
		8	4810	147 11	249 14	267 6	− 8 56	64
11	253 505	9	6247	300 6	312 47	316 58	+ 9 41	62
		0330	5927	295 38	310 24	314 35	+ 7 1	62
		1	2579	294 16	288 55	293 6	+ 7 6	63
		2	2039	291 47	285 43	289 54	+ 6 39	63
		3	2791	192 34	270 52	275 3	− 8 41	64
		4	3010	170 18	264 24	268 35	− 7 28	64
		5	3485	167 4	261 52	266 3	− 9 13	64
12	254 505	6	8044	300 2	328 48	318 48	+ 9 19	62
		7	7636	296 35	324 53	314 53	+ 6 48	62
		8	3257	236 30	285 9	275 9	− 8 48	64
		9	2605	217 29	278 29	268 29	− 7 28	64
	516	0340	8045	299 47	328 49	318 40	+ 9 6	62
		1	4761	295 39	303 27	293 18	+ 7 12	63
		2	3240	237 4	285 15	275 6	− 8 37	64
		3	2795	210 14	276 45	266 36	− 8 55	64
15	257 479	4	9116	298 7	343 50	291 39	+ 6 26	63
		5	7844	277 23	327 1	274 50	− 8 32	64
		6	7136	274 23	320 26	268 15	− 8 48	64
21		7						
22		8						
25	267 483	9	7706	130 54	239 22	45 17	− 7 11	65

1854.	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Sept 25		0350	8100	127 42	235 9	41 4	− 5 37	65
26	268 544	1	6457	133 5	250 37	41 29	− 5 45	65
		2	9419	106 30	217 45	8 37	+10 57	66
27	269 538	3	8449	107 44	231 41	8 27	+10 26	66
28	270 559	4	6990	107 52	246 12	8 29	+10 24	66
		5	9913	108 42	207 43	330 0	+ 8 0	67
29	271 554	6	5191	107 14	260 26	8 36	+10 13	66
		7	9323	110 17	222 33	330 43	+ 7 43	67
30	272 562	8	3117	103 18	274 48	8 40	+10 14	66
		9	8233	110 58	237 2	330 54	+ 7 56	67
Oct 1	273 524	0360	1097	80 38	288 29	8 43	+10 11	66
		1	6725	112 10	251 15	331 29	+ 7 31	67
		2	2731	79 58	280 29	0 43	+15 38	66
2	274 512	3	1557	322 59	302 44	8 57	+10 28	66
		4	4825	112 19	265 43	331 56	+ 7 34	67
		5	1645	24 23	294 57	1 10	+15 56	66
19		6						
20		7						
21		8						
22		9						
24	296 472	0370	4048	146 16	296 0	50 43	− 7 13	68
25		1						
31	303 476	2	8221	108 10	268 9	283 31	+ 7 48	69
Nov 1	304 512	3	6651	107 29	282 54	283 35	+ 7 47	69
3	306 492	4	2711	98 17	311 16	283 52	+ 8 4	69
6	309 520	5	4331	306 16	354 41	284 20	+ 8 45	69
9	312 478	6	9033	301 25	37 0	284 40	+ 9 6	69
11	314 553	7	8593	98 30	275 42	133 57	+13 30	70
		8	9260	98 26	266 54	125 9	+14 5	70
15	318 533	9	2144	48 3	332 52	134 40	+13 37	70
		0380	3288	74 50	322 48	124 36	+13 46	70
22	325 488	1	8133	274 1	38 25	101 34	−11 12	71
		2	7206	272 52	29 59	93 8	−10 23	71
23	326 462	3	9211	275 18	52 24	101 44	−11 47	71
		4	8498	275 40	43 29	92 49	−10 16	71
		5	4853	133 58	320 4	9 24	−10 19	72
		6	6138	126 45	310 19	359 39	− 9 27	72
		7	8136	92 29	293 4	342 24	+14 15	73
27	330 494	8	4949	264 10	17 55	10 4	−10 12	72
		9	3704	255 14	9 1	1 10	−10 13	72
		0390	2237	16 2	350 52	343 1	+14 3	73
29	332 505	1	8475	272 48	49 20	12 57	−11 14	72
		2	7923	273 4	43 49	7 26	−10 10	72
		3	7235	272 28	37 42	1 19	− 9 34	72
		4	6013	307 57	27 35	351 12	+13 17	73
		5	4989	313 37	19 43	343 20	+13 49	73
		6	3606	320 48	10 18	333 55	+12 29	73
30	333 485	7	9502	274 54	64 39	14 22	−10 36	72
		8	8590	274 56	51 54	1 37	− 9 21	72
		9	7959	300 1	45 23	355 6	+11 18	73
		0400	6680	305 59	33 42	343 25	+13 32	73
Dec 4		1						
6		2						

1854	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Dec 12	345 530	0403	3247	52 20	353 6	131 58	+13 26	74
		4	6163	121 0	329 22	108 14	−12 30	75
		5	7412	121 40	319 45	98 37	−15 22	75
		6	7215	116 37	320 38	99 30	−11 26	75
16	349 515	7	6723	300 58	49 33	131 53	+13 14	74
		8	3305	248 26	26 23	108 43	−10 57	75
		9	2744	212 22	16 2	98 22	−15 47	75
27		0410						
28		1						
Jan 3		2						
1855 5		3						
10	9 515	4	8497	254 10	93 3	180 47	−13 29	76
		5	8184	253 7	89 39	177 23	−14 7	76
		6	3203	338 55	41 3	128 47	+13 29	77
11	10 519	7	5509	293 18	66 5	139 34	+10 24	77
		8	5087	294 34	63 11	136 40	+ 9 47	77
		9	9407	93 15	325 48	39 17	− 7 17	79
13	12 508	0420	7270	93 26	351 30	36 47	− 8 22	79
		1	8056	94 43	344 26	29 43	− 9 34	79
14	13 552	2	7209	259 42	85 16	115 44	− 7 23	78
		3	6763	260 41	81 41	112 9	− 6 39	78
		4	5441	92 58	6 18	36 46	− 7 48	79
		5	6341	95 18	359 59	30 27	− 9 39	79
17	16 570	6	1294	243 19	49 12	36 52	− 7 25	79
		7	0767	187 15	43 13	30 53	− 9 5	79
18	17 493	8	3320	255 36	62 25	36 59	− 7 20	79
		9	2398	245 5	56 24	30 58	− 9 10	79
		0430	9740	74 11	327 26	302 0	+ 8 7	80
21	20 567	1	8622	256 34	105 59	36 57	− 7 36	79
		2	6107	61 40	11 11	302 9	+ 8 10	80
23	22 607	3	2591	20 45	41 2	303 4	+ 7 40	80
		4	2833	81 19	31 55	293 57	− 5 7	81
27		5						
29		6						
30		7						
Feb 10	40 552	8	5658	79 6	32 4	39 33	− 8 14	82
12	42 490	9	0784	69 17	64 6	44 6	− 6 20	82
		0440	1617	82 18	59 21	39 21	− 8 1	82
14	44 542	1	2997	247 14	88 8	39 2	− 8 6	82
15	45 512	2	5003	247 44	101 47	38 55	− 8 13	82
16	46 466	3	7191	247 33	118 49	42 25	− 8 0	82
		4	6738	246 57	115 11	38 47	− 8 30	82
		5	6777	251 9	115 22	38 58	− 5 40	82
17	47 550	6	8469	249 1	131 46	40 0	− 6 2	82
		7	8357	246 7	130 44	38 58	− 8 32	82
18	48 524	8	9344	244 58	144 18	38 43	− 8 29	82
20		9						
21		0450						
24	54 508	1	9272	60 6	14 10	183 42	+ 6 2	83
Mar 1	59 565	2	4588	26 34	65 35	163 23	+11 0	84
		3	3654	23 22	70 49	168 37	+ 7 59	84
3	61 552	4	3270	322 21	92 58	162 35	+11 9	84
		5	3352	299 46	99 54	169 31	+ 8 14	84

1855	Day	No.	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Mar 4	62 587	0456	4425	291 45	107 44	162 40	+11 7	84
		7	5165	276 45	115 56	170 52	+ 8 10	84
		8	8442	78 59	30 53	85 49	−13 28	85
5	63 528	9	5850	274 50	121 32	163 7	+ 9 29	84
		0460	6130	270 27	124 29	166 4	+ 7 57	84
		1	7105	79 4	44 27	86 2	−13 17	85
6	64 519	2	7418	267 31	135 36	163 8	+ 9 54	84
		3	7978	262 52	141 32	169 4	+ 7 59	84
		4	5436	80 21	58 8	85 40	−13 11	85
		5	5929	81 12	54 42	82 14	−14 5	85
		6	9791	74 59	11 58	39 30	− 9 9	86
7	65 490	7	8649	262 49	149 15	163 1	+ 9 53	84
		8	9239	258 55	157 34	171 20	+ 8 11	84
		9	3554	84 6	71 37	85 23	−12 44	85
		0470	9117	73 33	25 40	39 26	− 9 0	86
12	70 531	1	0392	160 17	97 7	39 22	− 9 21	86
13	71 528	2	2330	235 9	111 19	39 26	− 9 21	86
16	74 500	3	7973	239 12	154 7	40 4	− 9 4	86
19		4						
20		5						
26	84 465	6	5882	42 30	77 36	182 13	+ 6 52	87
27	85 610	7	3927	28 4	93 25	181 48	+ 6 58	87
29		8						
30	88 664	9	3529	308 38	123 51	168 54	+12 7	88
	"	1480	3369	316 40	120 52	165 55	+12 14	88
31		1						
April 2	91 535	2	6363	245 42	157 19	161 39	− 3 37	89
		3	7666	266 1	164 18	168 38	+12 34	88
4		4						
5	94 534	5	9065	75 46	55 21	17 8	−13 36	90
8		6						
10		7						
11		8						
12		9						
14		0490						
15		1						
16	"	2						
17		3						
18		4						
19	108 622	5	6804	263 35	175 3	297 0	+ 9 9	91
20	109 512	6	8114	259 13	187 53	297 13	+ 9 0	91
21		7				'		
22		8						
23		9						
24		0500						
26	115 506	1	7765	70 12	90 26	114 45	− 6 53	92
27	116 650	2	5703	70 29	107 47	115 52	− 6 38	92
28	117 507	3	3183	74 14	124 57	120 53	− 6 54	92
		4	3848	72 9	120 49	116 45	− 6 35	92
30		5						
May 2	121 514	6	2193	353 16	143 27	82 32	+ 8 9	93
		7	2632	8 34	139 0	78 5	+ 8 54	93
		8	8643	52 15	89 0	28 5	+ 9 46	95

1855	Day	No	Dist.	Pos	Fr Node.	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
May 3	122 504	0509	2646	291 59	158 49	83 52	+ 7 9	93
		0510	2453	320 5	152 6	77 9	+ 9 47	93
		1	2168	10 11	141 11	66 14	+ 6 32	94
		2	7338	49 42	102 51	27 54	+ 9 18	95
5	124 506	3	6449	261 2	188 52	85 31	+ 6 27	93
		4	6402	263 52	188 3	84 42	+ 8 7	93
	515	5	5590	271 43	180 57	77 29	+10 37	93
		6	3738	279 27	168 30	65 2	+ 8 15	94
		7	3433	287 30	165 17	61 49	+ 9 29	94
8		8						
9		9						
12		0520						
20	139 531	1	7671	255 49	214 11	257 43	+ 2 51	96
24		2						
25		3						
26		4						
27		5						
29		6						
30		7						
June 2		8						
4		9						
5		0530						
6		1						
7		2						
9	159 578	3	5727	69 24	149 2	268 13	+ 5 7	97
		4	6416	71 46	143 57	263 8	+ 4 10	97
10	160 544	5	3627	65 5	163 48	269 17	+ 5 12	97
		6	4280	74 59	159 17	264 46	+ 1 51	97
11	161 517	7	1395	45 45	178 41	270 21	+ 4 59	97
		8	1752	65 39	175 36	267 16	+ 2 54	97
		9	2197	69 48	172 55	264 35	+ 2 34	97
14	164 575	0540	5542	266 40	221 40	269 58	+ 4 38	97
		1	4858	268 20	217 1	265 19	+ 5 1	97
16	166 568	2	8713	264 53	250 35	270 37	+ 4 17	97
		3	8169	266 0	244 43	264 45	+ 5 4	97
17		4						
19		5						
20		6						
21		7						
22		8						
24		9						
25		0550						
26		1						
27		2						
28		3						
29		4						
30		5						
July 1		6						
2		7						
3		8						
4		9						
5		0560						
6		1						

1855	Day	No	Dist.	Pos	Fr Node	H. Long	H Lat	Group
				° ′	° ′	° ′	° ′	
July 7		0562						
8		3						
10		4						
12		5						
13		6						
14		7						
15		8						
16		9						
18		0570						
20		1						
21		2						
23		3						
24	204 684	4	6135	114 23	190 20	29 43	− 5 54	98
25		5						
27		6						
29		7						
30		8						
Aug 1		9						
2		0580						
3		1						
4	215 587	2	0381	254 29	238 47	283 30	+ 5 0	99
		3	0364	138 54	235 11	279. 54	+ 4 46	99
5	216 534	4	2711	281 19	253 29	284. 46	+ 5 31	99
		5	1988	274 9	249 5	280 22	+ 4 18	99
6	217 645	6	·5175	284 26	270 2	285 34	+ 6 2	99
		7	4318	281 8	264 23	279 55	+ 4 46	99
7	218 549	8	6945	285 38	283 46	286 28	+ 6 5	99
		9	6054	283 13	276 57	279 39	+ 4. 54	99
8	219 584	0590	8447	287. 24	298. 30	286 32	+ 6 30	99
		1	7719	285. 12	291 16	279 18	+ 5 10	99
9	220 559	2	9426	288 45	312 23	286 34	+ 6 34	99
10		3						
11		4						
12		5						
13	224 536	6	3508	100 3	224. 55	142 42	+ 8 0	100
15		7						
16		8						
17		9						
18		0600						
19		1						
21		2						
22		3						
23		4						
24		5						
25		6						
26		7						
27		8						
28		9						
29		0610						
30		1						
31		2						
Sept 1		3						
3		4						

1855	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Sept 4		0615						
5		6						
6		7						
9		8						
11		9						
12		0620						
13		1						
16		2						
19	261 483	3	2219	325 20	292 48	46 31	+13 20	101
20		4						
21		5						
23		6						
24		7						
25		8						
26		9						
Oct 1		0630						
2	274 516	1	3984	258 43	312 55	241 46	− 7 46	102
		2	3635	256 5	310 36	239 27	− 7 13	102
4	276 492	3	7692	280 1	344 23	245 12	− 8 8	102
		4	6984	276 5	337 46	238 35	− 9 6	102
		5	3244	187 44	290 20	191 9	−11 26	103
8		6						
9		7						
10		8						
13	285 491	9	3981	147 42	285 22	58 33	− 6 23	104
		0640	4567	141 46	280 53	54 4	− 5 55	104
14		1						
15		2						
16		3						
17	289 542	4	3526	240 46	321 1	36 44	−11 22	105
		5	3299	234 44	318 30	34 13	−11 18	105
18	290 495	6	5051	262 49	335 37	37 49	−11 7	105
20	292 573	7	8301	278 46	6 1	38 44	−11 6	105
		8	7860	276 32	1 18	34 1	−11 42	105
		9	0236	349 7	313 8	345 51	+ 6 23	105
	596	0650	8305	278 22	5 59	38 23	−11 26	105
		1	7892	276 28	1 36	34 0	−11 50	105
		2	0177	319 7	313 17	345 41	+ 5 42	106
24	296 563	3	8049	109 23	262 37	238 45	+ 8 0	107
27	299 541	4	2366	103 20	305 50	239 43	+ 7 22	107
28	300 539	5	0432	27 33	320 9	239 53	+ 7 4	107
Nov 1	304 506	6	7956	300 10	16 55	240 23	+ 7 0	107
4		7						
5		8						
6		9						
9		0660						
14		1						
15		2						
16		3						
22		4						
23		5						
26		6						
27		7						

1855	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Nov 30	333 487	0668	3888	292 27	15 58	188 21	+ 3 6	108
		9	3295	295 21	12 14	184 37	+ 3 42	108
Dec 2	335 527	0670	7894	287 54	47 15	190 42	+ 2 8	108
		1	7114	290 10	40 26	183 53	+ 3 37	108
3	336 490	2	8999	285 48	60 12	189 59	+ 0 40	108
		3	8506	289 5	54 19	184 6	+ 3 29	108
5		4						
6		5						
7		6						
8		7						
11		8						
12		9						
13		0680						
16		1						
18		2						
19		3						
20	353 510	4	6120	264 17	50 26	298 48	− 9 32	109
		5	5696	260 59	47 4	295 26	−10 51	109
		6	2493	48 36	4 2	252 24	+ 9 10	110
21		7						
22		8						
24		9						
25		0690						
27		1						
28		2						
29		3						
30		4						
31		5						
Jan 2		6						
1856 6		7						
7		8						
10		9						
12		0700						
13		1						
14		2						
15		3						
23		4						
25		5						
27		6						
28		7						
29		8						
Feb 3		9						
5		0710						
9	39 526	1	8123	270 30	117 22	2 6	+ 8 51	111
		2	7735	272 18	113 25	358 9	+ 9 15	111
14		3						
16		4						
23	53 557	5	9245	263 25	145 5	190 48	+ 9 32	112
		6	8788	265 54	138 33	184 16	+10 22	112
24		7						
26		8						
29		9						
Mar 5		0720						

1856	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	′ °	
Mar 8		0721						
10		2						
12		3						
13		4						
16		5						
19		6						
20		7						
22		8						
23		9						
24		0730						
27		1						
28		2						
29		3						
30		4						
31		5						
April 1		6						
2		7						
4		8						
5		9						
7		0740						
10	100 572	1	8843	73 29	64 5	162 55	−11 21	113
		2	9403	71 39	56 5	154 55	− 9 27	113
16	106 458	3	3036	219 11	148 39	164 0	−12 23	113
		4	2829	215 25	147 2	162 23	−12 53	113
17	107 507	5	5100	228 36	163 26	163 54	−12 19	113
18	108 509	6	6910	231 23	177 48	164 3	−12 30	113
19	109 640	7	8500	232 53	193 44	163 57	−12 19	113
		8	5546	46 29	103 32	73 45	+ 5 26	114
20	110 532	9	9374	233 2	206 14	163 48	−12 19	113
		0750	3514	34 57	118 29	76 3	+ 5 10	114
		1	4252	36 59	114 4	71 38	+ 6 38	114
21	111 522	2	1832	351 54	134 7	77 38	+ 5 9	114
23		3						
24		4						
25		5						
26		6						
28		7						
30		8						
May 2		9						
3		0760						
4		1						
5		2						
10		3						
11		4						
13		5						
14		6						
15		7						
16		8						
17		9						
18		0770						
19		1						
20		2						
21		3						

1856	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
May 25		0774						
26		5						
27		6						
28	148 631	7	0929	287 0	177 21	314 30	+ 2 3	115
29		8						
30		9						
June 1		0780						
2	153 518	1	5768	197 16	198 3	265 53	−29 26	116
		2	5790	184 57	191 1	258 51	−33 11	116
3	154 514	3	6643	205 53	208 18	262 0	−30 31	116
		4	6606	198 3	203 42	257 24	−33 55	116
		5	2758	299 12	190 12	243 54	+10 44	117
		6	2381	307 8	187 9	240 51	+10 30	117
4	155 513	7	7799	217 31	223 34	263 6	−29 0	116
		8	4830	279 38	206 10	245 42	+11 3	117
		9	4049	282 30	200 59	240 31	+10 18	117
6	157 505	0790	9608	227 12	252 38	263 55	−28 15	116
		1	8234	270 13	235 51	247 8	+11 4	117
		2	7483	270 32	228 48	240 5	+10 19	117
9	160 549	3	8216	265 22	239 6	207 12	+ 6 18	118
		4	7876	265 30	235 48	203 54	+ 6 11	118
10	161 508	5	9230	264 47	252 13	206 43	+ 6 6	118
		6	3501	303 32	199 55	154 25	+14 55	119
		7	3141	304 53	197 59	152 29	+13 44	119
11		8						
15		9						
16		0800						
20		1						
21		2						
24		3						
25		4						
26		5						
27		6						
28		7						
29		8						
30		9						
July 1		0810						
2		1						
3	184 517	2	4221	116 18	184 52	173 0	− 8 14	120
4		3						
5		4						
6		5						
9		6						
10		7						
15		8						
16		9						
17		0820						
19		1						
21		2						
22	203 535	3	9772	90 49	147 3	225 26	+ 7 15	121
23	204 500	4	9098	92 7	160 20	225 1	+ 7 5	121
24	205 572	5	7792	93 11	175 44	225 13	+ 7 2	121
25	206 470	6	6391	93 42	188 6	224 50	+ 7 5	121

1856	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
July 26	207 510	0827	4368	93 24	202 59	224 58	+ 7 13	121
28	209 593	8	0445	323 4	232 43	225 9	+ 7 19	121
29	210 478	9	2406	286 55	245 35	225 28	+ 7 7	121
30	211 501	0830	4576	283 53	259 56	225 19	+ 6 39	121
31	212 509	1	6430	283 24	273 43	224 48	+ 6 4	121
Aug 1		2						
2		3						
3	215 535	4	5615	51 28	212 3	120 12	+31 4	122
4		5						
5		6						
6		7						
7		8						
9		9						
10		0840						
11		1						
12		2						
13		3						
14		4						
15		5						
16	228 505	6	9555	117 20	177 46	261 57	− 8 1	123
17	229 599	7	8473	120 44	194 8	262 48	− 7 46	123
21	233 565	8	2592	185 38	250 40	263 5	− 7 42	123
22	234 507	9	2962	231 21	264 7	263 10	− 7 32	123
23	235 512	0850	4518	257 1	278 30	263 18	− 7 22	123
26	238 513	1	9050	278 9	321 54	264 8	− 7 24	123
		2	7979	273 25	309 18	251 32	− 8 33	123
27	239 554	3	9714	281 14	334 42	262 10	− 6 50	123
		4	9078	278 35	323 18	250 46	− 7 20	123
28		5						
30	242 521	6	8989	144 0	206 16	91 38	−25 33	124
31	243 503	7	8005	150 55	220 46	92 13	−25 35	124
		8	8594	146 29	212 55	84 22	−25 21	124
Sept 1	244 580	9	6864	159 36	234 35	90 45	−24 32	124
		0860	7525	154 34	227 26	83 36	−25 16	124
2	245 513	1	5893	174 57	248 42	91 38	−24 49	124
		2	6197	168 47	243 58	86 54	−24 38	124
3	246 512	3	5414	196 21	263 16	92 2	−25 19	124
		4	5435	187 15	257 55	86 41	−24 31	124
4	247 502	5	5565	217 49	277 4	91 47	−25 12	124
		6	5300	209 1	271 32	86 15	−24 28	124
5	248 514	7	6364	235 53	291 20	91 43	−25 21	124
		8	5859	229 24	285 29	85 52	−24 30	124
6	249 542	9	7457	248 15	305 40	91 27	−25 36	124
		0870	6930	246 14	300 58	86 45	−23 56	124
7	250 515	1	7974	255 11	314 3	86 2	−23 57	124
8		2						
11	254 520	3	6154	67 23	244 13	319 24	+32 31	125
		4	6379	70 10	241 28	316 39	+32 0	125
13	256 612	5	4220	30 14	273 24	318 54	+31 48	125
		6	4348	37 3	269 51	315 21	+32 1	125
14	257 506	7	4351	7 32	285 43	318 33	+31 34	125
		8	4291	15 16	281 49	314 39	+32 3	125
15		9						

1856	Day	No	Dist.	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Sept 16		0880						
18	261 563	1	5692	197 20	276 35	251 52	−27 12	126
19	262 482	2	5703	215 39	289 3	251 17	−26 59	126
		3	5844	211 1	286 15	248 29	−28 23	126
20		4						
21		5						
23		6						
25		7						
26		8						
29		9						
30		0890						
Oct 1		1						
2		2						
7		3						
20		4						
21		5						
26		6						
27	300 465	7	5285	189 39	310 54	94 23	−25 54	127
		8	5338	184 43	309 47	93 16	−21 29	127
29	302 542	9	9625	144 50	252 31	6 32	−27 11	128
30	303 570	0900	8710	149 58	269 50	9 1	−27 32	128
Nov 1	305 535	1	6646	166 39	297 40	9 14	−27 55	128
3	307 542	2	5296	200 27	324 51	7 56	−27 51	128
4	308 511	3	5488	220 24	338 6	7 27	−27 51	128
5		4						
6		5						
9		6						
10		7						
11		8						
12		9						
13		0910						
14		1						
15	319 509	2	6209	178 25	322 32	195 53	−32 18	129
		3	6664	175 30	318 35	191 56	−34 20	129
16	320 506	4	5753	195 35	336 22	195 34	−32 20	129
		5	6166	188 37	330 51	190 3	−34 27	129
18	322 533	6	6484	234 10	6 42	197 10	−30 26	129
		7	6483	222 57	359 34	190 2	−34 29	129
19	323 511	8	7162	234 29	12 15	188 50	−34 13	129
23		9						
24	328 531	0920	9156	257 2	49 51	155 13	−27 40	130
25	329 487	1	9628	259 14	60 18	152 7	−27 8	130
26	330 549	2	9734	144 10	277 32	354 17	−35 0	132
27	331 500	3	4346	215 35	359 32	62 48	−23 9	131
		4	9187	147 12	291 18	354 34	−35 25	132
29	333 504	5	7387	160 7	320 31	355 21	−35 36	132
30	334 485	6	6627	170 22	333 17	354 12	−35 47	132
Dec 1	335 493	7	6074	184 59	347 1	353 38	−35 51	132
2		8						
4		9						
7		0930						
11		1						
12		2						

1856	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Dec 14		0933						
15		4						
16		5						
19	353 499	6	6662	133 39	337 1	88 14	−24 6	133
		7	7901	130 29	325 59	77 12	−26 13	133
23	357 545	8	4496	215 36	31 26	85 16	−24 59	133
		9	3996	210 3	27 30	81 20	−23 25	133
		0940	4173	203 21	25 12	79 2	−25 29	133
24	358 513	1	6020	233 43	47 59	88 5	−25 32	133
		2	5071	229 56	40 55	81 1	−23 14	133
		3	4697	215 13	33 15	73 21	−26 9	133
26	360 468	4	8101	245 39	71 18	83 41	−24 35	133
		5	7744	245 59	67 53	80 16	−23 23	133
27	361 503	6	9202	248 48	86 54	84 35	−24 11	133
		7	8901	249 31	82 37	80 18	−22 56	133
28	362 500	8	9586	250 12	95 13	78 46	−23 10	133
29		9						
Jan 1	0 478	0950	7140	121 36	344 14	271 21	−23 12	134
1857 2	1 492	1	5358	128 35	0 13	272 57	−21 53	134
		2	6212	127 48	354 20	267 4	−24 28	134
3	2 501	3	3810	149 2	16 1	274 27	−22 11	134
		4	4983	139 42	7 21	265 47	−25 13	134
5	4 538	5	3957	215 20	44 51	274 23	−22 15	134
10	9 560	6	9736	245 16	112 46	271 4	−22 20	134
		7	6254	335 3	51 34	209 52	+31 13	135
		8	5966	343 43	44 57	203 15	+31 10	135
12	11 456	9	7986	310 31	79 1	210 25	+30 29	135
		0960	7340	319 6	68 56	200 20	+31 55	135
		1	9306	53 25	335 7	106 31	+28 22	136
14	13 503	2	9585	299 2	107 2	209 24	+30 23	135
		3	9077	303 25	96 23	198 45	+31 30	135
		4	7542	40 26	2 20	104 42	+28 28	136
		5	8113	44 2	355 35	97 57	+29 3	136
		6	9739	80 31	323 21	65 43	+ 3 38	137
		7	8809	46 44	346 42	89 4	+30 36	136
16	15 507	8	7593	75 16	353 8	67 5	+ 3 46	137
17	16 594	9	5759	69 12	8 56	67 28	+ 4 21	137
19	18 591	0970	2106	28 27	37 46	67 58	+ 4 49	137
		1	2088	32 39	37 8	67 20	+ 4 12	137
21	20 502	2	3622	291 0	65 12	68 17	+ 5 4	137
		3	3449	290 24	64 22	67 27	+ 4 22	137
23	22 538	4	9236	110 47	341 56	316 9	−29 18	138
24	23 649	5	8139	112 36	358 1	316 28	−28 50	138
28	27 481	6	4076	161 52	50 28	314 34	−29 32	138
29	28 476	7	4301	187 32	64 1	314 0	−29 42	138
30		8						
31		9						
Feb 1		0980						
4	34 468	1	9204	107 42	354 24	159 24	−31 18	139
		2	9602	112 2	346 46	151 46	−36 4	139
6	36 492	3	7038	114 52	23 33	159 50	−31 28	139
		4	8137	115 57	13 14	149 31	−36 4	139
9	39 416	5	4322	160 36	64 4	158 53	−31 59	139

1857	Day	No	Dist	Pos	Ft Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Feb 9		6	5328	144 14	52 53	147 42	−36 17	139
11	41 489	7	5422	200 1	90 16	155 40	−31 57	139
		8	5212	181 49	79 39	145 3	−36 5	139
12	42 505	9	6574	210 34	103 41	154 41	−31 57	139
		0990	6028	196 52	93 25	144 25	−36 10	139
		1	6970	101 16	5 35	56 35	−28 0	140
13	43 474	2	7722	216 12	116 53	154 8	−32 9	139
		3	7022	205 58	106 26	143 41	−36 17	139
15	45 515	4	9478	220 11	144 8	152 26	−32 28	139
		5	5167	117 36	48 3	56 21	−27 45	140
16	46 507	6	9885	219 40	156 53	151 7	−32 48	139
		7	3994	136 48	62 10	56 24	−27 51	140
17	47 581	8	3627	168 34	77 7	56 7	−27 54	140
18		9						
20		1000						
22		1						
23		2						
24		3						
25		4						
26		5						
28		6						
Mar 1		7						
3		8						
4		9						
5	63 550	1010	3309	183 12	99 32	212 1	−24 18	141
		1	3128	176 0	96 44	209 13	−24 16	141
6	64 582	2	4749	207 22	114 59	212 50	−24 9	141
		3	4231	201 8	110 15	208 6	−24 24	141
7		4						
8		5						
9		6						
10		7						
11		8						
12		9						
14		1020						
15	73 519	1	7838	98 11	51 15	22 20	−29 50	142
		2	8304	97 50	46 7	17 12	−30 42	142
16	74 501	3	6515	103 53	65 44	22 53	−29 44	142
17	75 523	4	5166	116 9	80 31	23 10	−30 8	142
18	76 514	5	4216	135 51	94 19	22 55	−30 16	142
21		6						
22		7						
23		8						
24		9						
26		1030						
27		1						
28		2						
31	89 633	3	8188	284 48	160 41	263 12	+27 57	143
April 1	90 570	4	9046	279 19	173 55	263 8	+28 21	143
		5	9691	90 22	40 32	129 45	−27 22	144
6	95 523	6	3773	142 56	117 49	136 47	−27 43	144
		7	4405	120 28	106 39	125 37	−27 24	144
7	96 614	8	3970	176 41	133 26	136 55	−27 14	144

1857	Day	No	Dist.	Pos	Fr Node	H Long	H. Lat.	Group
				° ′	° ′	° ′	° ′	
Apr 7		1039	4041	150 12	121 49	125 18	−29 40	144
9	98 555	1040	6393	207 24	160 30	136 27	−26 57	144
		1	5279	192 4	147 25	123 22	−29 46	144
10	99 502	2	7654	213 14	173 41	136 13	−26 43	144
		3	6443	202 48	160 13	122 45	−29 41	144
12	101 577	4	9596	217 11	202 31	135 36	−27 2	144
		5	8760	212 14	187 47	120 52	−30 9	144
		6	8995	94 6	65 14	358 19	−29 40	145
14		7						
15		8						
17		9						
18		1050	.	.				
19		1				.		
20		2						
21		3	.					
24	.	4						
27		5	.					.
29	118 517	6	9742	87 0	67 28	120 17	−21 50	146
30	119 494	7	8974	87 34	82 33	121 30	−21 21	146
		8	9330	87 37	77 7	116 4	−21 52	146
May 2	121 483	9	6346	95 48	111 30	122 14	−21 24	146
		1060	7084	92 42	105 0	115 44	−21 18	146
3	122 583	1	4632	108 21	127 7	122 15	−21 29	146
5	124 590	2	3227	169 29	155 2	121 42	−21 47	146
6	125 487	3	4099	196 16	167 41	121 38	−21 42	146
7	126 623	4	5823	213 12	183 48	121 38	−21 44	146
9	128 623	5	8551	223 51	211 45	121 13	−21 48	146
		6	6441	104 15	119 52	29 20	−25 5	147
		7	6923	103 27	115 56	25 24	−26 16	147
11	130 483	8	9867	226 22	237 5	120 10	−21 52	146
		9	4142	139 26	147 33	30 38	−25 52	147
		1070	4330	128 57	142 55	26 0	−24 57	147
13	132 463	1	4853	192 28	175 41	30 41	−26 13	147
		2	4502	181 17	169 24	24 24	−27 3	147
14	133 521	3	6404	207 48	191 53	31 52	−26 57	147
		4	5623	205 15	185 48	25 47	−25 1	147
		5	5667	196 26	182 23	22 22	−28 56	147
		6	3568	144 29	153 44	353 43	−22 40	148
		7	3640	140 29	152 6	352 5	−22 39	148
		8	9553	46 4	88 59	288 58	+20 51	152
15	134 514	9	7581	215 28	204 50	30 44	−26 32	147
		1080	6780	206 6	194 44	20 38	−29 29	147
		1	8973	43 25	99 56	285 50	+21 40	152
16	135 511	2	8719	219 41	218 56	30 42	−26 50	147
		3	7969	213 49	208 50	20 36	−29 8	147
		4	7430	36 5	119 9	290 55	+22 18	152
		5	7927	40 53	113 13	284 59	+20 38	152
		6	7285	115 22	123 56	295 42	−33 20	151
		7	7319	112 16	122 14	294 0	−31 34	151
		8	8644	106 33	106 18	278 4	−32 44	153
17	136 525	9	9592	222 25	234 30	31 53	−26 45	147
		1090	8917	218 0	222 3	19 26	−29 1	147
		1	5944	24 42	135 5	292 28	+22 48	152

1857	Day	No	Dist.	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
May 17		1092	6673	34 18	126 38	284 1	+20 52	152
		3	6160	122 26	136 19	293 42	−31 14	151
18	137 525	4	9606	220 1	235 24	18 36	−29 19	147
		5	4630	6 27	150 14	293 26	+22 20	152
		6	5351	25 10	139 18	282 30	+20 10	152
		7	3780	178 4	170 20	313 32	−23 3	150
		8	3472	172 26	167 39	310 51	−21 50	150
		9	5171	142 35	152 37	295 49	−31 30	151
		1100	6619	120 15	133 7	276 19	−32 18	153
19	138 593	1	4135	336 14	165 54	293 57	+22 16	152
		2	4064	346 3	161 35	289 38	+21 45	152
		3	4101	3 49	154 5	282 8	+20 3	152
		4	4982	202 28	185 21	313 24	−23 26	150
		5	4553	197 12	181 17	309 20	−23 9	150
		6	6258	120 42	136 35	264 38	−30 27	154
20	139 504	7	8691	281 52	220 17	335 24	+25 41	149
		8	6303	213 56	198 17	313 24	−23 36	150
		9	5799	210 33	193 45	308 52	−23 28	150
		1110	4672	313 2	178 25	293 32	+22 32	152
		1	4339	318 39	174 58	290 5	+21 47	152
24	143 513	2	9229	277 59	233 2	291 17	+23 16	152
		3	9824	228 20	247 20	305 35	−23 24	150
		4	7041	202 13	201 46	260 1	−33 32	154
		5	5094	67 20	138 23	196 38	+ 1 7	155
26	145 519	6	9883	94 22	89 56	119 44	−21 41	157
27	146 504	7	9373	95 29	103 26	119 16	−21 25	157
28	147 544	8	8408	98 28	117 58	119 3	−21 26	157
30	149 511	9	5742	112 33	145 44	118 55	−21 29	157
June 1	151 500	1120	7411	285 13	219 37	164 35	+21 39	156
		1	3692	157 7	173 21	118 19	−21 49	157
2	152 672	2	8781	280 20	236 5	164 26	+21 41	156
		3	4150	192 28	189 15	117 36	−21 53	157
		4	9884	103 18	97 31	25 52	−27 46	158
3	153 580	5	9560	278 35	249 33	165 1	+21 52	156
		6	5283	211 4	202 12	117 40	−21 50	157
		7	9532	104 38	108 28	23 56	−27 38	158
4	154 505	8	6562	221 26	214 42	117 3	−21 49	157
		9	8992	108 18	119 23	21 44	−28 47	158
5	155 507	1130	7892	228 25	228 35	116 43	−21 36	157
		1	8084	113 17	132 45	20 53	−28 59	158
		2	8728	110 10	124 23	12 31	−29 1	158
7	157 658	3	9731	235 17	257 31	115 8	−21 11	157
		4	5854	134 57	161 19	18 56	−29 19	158
		5	6518	126 24	153 7	10 44	−29 13	158
8	158 561	6	5222	151 25	173 30	18 19	−29 36	158
		7	5620	139 51	165 42	10 31	−29 21	158
10		8						
11		9						
12		1140						
13		1						
14	164 518	2	5928	210 41	213 58	334 17	−25 38	159
		3	5477	208 16	210 28	330 47	−24 22	159
15	165 509	4	6709	221 11	224 11	330 26	−24 3	159

1857	Day	No	Dist.	Pos	Fi Node.	H. Long	H Lat	Group
June 15		1145	7561	128° 7′	152° 26′	258° 41′	−32° 54′	160
16		6						
17		7						
18		8						
19		9						
20		1150						
21		1						
22		2						
23	173 518	3	9774	106 21	121 29	114 8	−21 19	161
24	174 528	4	9187	109 4	134 35	112 55	−21 28	161
25	175 529	5	8229	113 46	148 23	112 31	−21 52	161
26	176 421	6	7160	119 41	160 35	112 4	−21 53	161
27	177 645	7	5651	133 6	176 48	110 55	−22 3	161
28	178 512	8	4710	149 16	188 41	110 30	−22 6	161
29	179 667	9	4268	180 15	204 40	110 6	−22 17	161
		1160	8851	124 34	148 25	53 51	−31 10	163
		1	9231	122 22	142 0	47 26	−31 6	163
July 6	186 474	2	7115	300 36	251 20	60 13	+23 55	162
		3	6063	308 11	241 4	49 57	+25 2	162
		4	8518	119 14	156 13	325 6	−22 32	164
7	187 531	5	8418	296 20	266 3	59 56	+23 41	162
		6	7482	300 52	255 37	49 30	+24 51	162
		7	7351	126 15	170 29	324 22	−22 40	164
8	188 587	8	9375	295 2	280 37	59 32	+23 57	162
		9	8684	297 7	270 11	49 6	+24 34	162
		1170	5386	149 18	193 42	332 37	−23 38	164
		1	6821	89 53	168 37	307 32	+ 3 25	165
		2	7553	90 28	162 36	301 31	+ 2 43	165
9	189 493	3	9859	295 5	293 17	59 20	+24 7	162
		4	4914	91 51	183 2	309 5	+ 3 4	165
		5	5999	91 42	175 38	301 41	+ 2 49	165
11	191 494	6	0297	153 47	213 29	311 9	+ 2 34	165
		7	1818	98 29	203 55	301 35	+ 2 50	165
12	192 503	8	2339	264 49	228 36	311 58	+ 2 14	165
		9	0592	261 49	218 35	301 57	+ 3 31	165
13	193 495	1180	7655	237 54	258 52	328 9	−22 58	164
		1	4674	269 45	243 55	313 12	+ 2 14	165
		2	3049	272 23	233 54	303 11	+ 3 51	165
		3	9566	128 51	149 40	218 57	−22 23	166
14	194 505	4	6015	273 20	254 3	309 1	+ 3 22	165
		5	8921	133 20	163 12	218 10	−22 17	166
15		6						
16		7						
17	197 529	8	7166	61 26	178 11	190 15	+26 39	167
		9	7622	63 39	173 30	185 34	+26 24	167
18	198 698	1190	5315	50 51	196 17	191 46	+26 6	167
		1	6690	56 4	185 4	180 33	+28 50	167
		2	6173	57 54	188 15	183 44	+25 58	167
19	199 524	3	4189	34 35	208 59	192 45	+26 7	167
		4	5257	49 10	198 10	181 56	+26 45	167
20	200 517	5	3631	4 18	223 38	193 19	+26 5	167
		6	3847	20 59	216 36	186 17	+26 36	167
		7	4080	30 0	212 18	181 59	+26 37	167

1857	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
July 20		1198	4561	31 55	209 51	179 32	+28 55	167
21	201 497	9	3797	349 57	230 45	186 32	+26 11	167
		1200	3773	2 51	225 24	181 11	+27 0	167
22	202 600	1	5690	319 15	252 57	193 6	+26 53	167
		2	4986	322 50	247 27	187 36	+25 33	167
		3	4481	335 25	240 8	180 17	+27 14	167
23	203 489	4	6894	311 27	265 18	192 50	+26 37	167
		5	6347	312 44	260 40	188 12	+25 42	167
		6	5501	321 58	251. 47	179 19	+27 15	167
24	204 504	7	7831	307 51	275 46	188. 54	+26 28	167
		8	6835	313 30	265 10	178 18	+27 31	167
25	205 622	9	9058	304 47	292 8	189 25	+26 8	167
		1210	8226	308 18	280. 59	178 16	+27 28	167
		1	9270	74 47	159 47	57 4	+23 46	168
26	206 622	2	9794	304 33	308 6	191 11	+26 20	167
		3	9185	306 25	294. 58	178 3	+27 28	167
		4	8303	73 18	173 46	56. 51	+24 1	168
28		5						
29		6						
30		7						
31		8						
Aug 3		9						
4		1220						
5		1						
6		2						
9		3						
10		4						
12	223 660	5	8825	132 24	188 27	189 52	−20 9	170
		6	8627	77 9	186 18	187 43	+27 29	171
13	224 561	7	7852	138 5	201 12	189. 50	−20 15	170
		8	7639	74. 47	198 28	187 6	+27 31	171
14	225 581	9	6653	147 40	215 0	189. 9	−20 36	170
		1230	6314	69 7	212 19	186 28	+27 40	171
16	227 492	1	4736	181 56	241 27	188 31	−20 31	170
		2	4016	39 0	238. 51	185 55	+28 18	171
17	228 449	3	4702	207 46	255 7	188 36	−20 42	170
		4	3716	11 39	251 57	185 26	+28 21	171
18	229 489	5	5475	231 8	269 40	188. 24	−20 33	170
		6	4440	345. 0	266 19	185 3	+28 29	171
19	230 528	7	8770	313 1	312 52	216 52	+25 27	169
		8	8405	314. 54	308 7	212 7	+26 29	169
		9	6676	246 12	283 53	187. 53	−20. 24	170
		1240	5701	329 43	280 22	184. 22	+28 23	171
20		1						
21		2						
22	233 501	3	9916	139 9	177 23	39 13	−28 59	173
23	234 503	4	9460	142 29	191. 55	39 32	−28 38	173
24	235 461	5	8790	147 9	204. 39	38. 41	−28 31	173
25	236 526	6	7845	155 16	219 7	38 2	−28 44	173
		7	7596	89 17	208 30	27. 25	+19 48	174
26	237 511	8	8131	254 3	304 24	109 21	−23 27	172
		9	6935	166 15	232 41	37. 38	−28 56	173
		1250	5904	85. 58	223. 42	28 29	+19 32	174

1857	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Aug 27	238 551	1251	9238	261 13	321 3	111 15	−23 11	172
		2	6182	182. 42	247 25	37 37	−29 8	173
		3	4053	75 19	238 53	29 5	+19 54	174
		4	4887	79 12	232. 59	23 11	+20 47	174
28	239 510	5	5921	199. 25	259 52	36 28	−29 4	173
		6	2619	52. 12	252 3	28 39	+19 47	174
		7	3497	62 5	245 59	22 35	+21 54	174
30	241 496	8	6817	233 8	286 50	35 15	−28 38	173
		9	3663	327 57	280 22	28 47	+19 29	174
31	242 500	1260	7703	244. 33	300 15	34. 26	−28 17	173
		1	5409	316 25	294. 29	28 40	+19 27	174
		2	4601	324. 29	287 36	21 47	+21 7	174
Sept 1	243 514	3	8618	252 45	313 54	33 42	−27 57	173
		4	6310	237 52	288 32	8 20	−23 53	175
2	244 565	5	9408	258 28	328 12	33 6	−27 50	173
		6	7340	250 1	302 0	6 54	−23 24	175
		7	9388	133 1	199 23	264. 17	−17 13	177
5	247 450	8	6063	153 16	239 43	263 41	−17 4	177
		9	4215	356 10	280 26	304 24	+29 9	176
		1270	3751	8 13	274. 9	298 7	+28 22	176
		1	9574	93 3	193 47	217. 45	+20 26	179
6	248 646	2	5678	336 42	297 13	304 13	+29 35	176
		3	4931	341 41	290 51	297 51	+28 30	176
		4	8128	143 22	221 39	228 39	−19 48	178
		5	8701	92 43	208 34	215 34	+20 46	179
		6	9116	93 57	202. 55	209 55	+19 52	179
7	249 489	7	6804	329. 22	308 56	303 59	+29 32	176
		8	6623	154 57	238 48	233 51	−20 15	178
		9	7094	149 36	233 21	228 24	−19 25	178
		1280	7701	91 47	220. 12	215 15	+20 39	179
		1	·8237	93. 47	214. 38	209 41	+19 38	179
10	252·451	2	5021	237 8	290 5	243 7	−17 44	178
		3	·4776	220 11	281 32	234 34	−20 1	178
		4	·4574	208. 24	275 33	228 35	−19 50	178
		5	8588	150. 17	223 11	176 13	−26 31	180
		6	2808	57. 12	263 33	216 35	+20 29	179
		7	3495	74. 0	256 31	209 33	+19 37	179
		8	·4394	84. 59	249 10	202 12	+18 34	179
		9	7656	88 59	224 0	177 2	+23 9	181
		1290	·8550	91 38	214. 15	167 17	+22 14	181
13	255·520	1	5406	322 9	306 40	216 10	+20 55	179
		2	4551	323 27	300 51	210 21	+19 24	179
		3	3722	329 9	294 49	204. 19	+19 6	179
		4	5859	186 25	264 46	174 16	−26 51	180
		5	2878	46 24	269 20	178 50	+22 26	181
		6	4406	71 16	255 27	164. 57	+23 59	181
		7	9460	135 39	208 57	118 27	−17 50	182
14	256 668	8	7195	316 52	322 27	215 40	+21 10	179
		9	6133	316 51	313 58	207 11	+19 23	179
		1300	5516	316 13	309 37	202 50	+17 57	179
		1	5569	209 3	280 18	173 31	−26 27	180
		2	3008	358 27	285 21	178 34	+22 42	181
		3	3183	43 39	270 35	163 48	+24 27	181

1857	Day	No.	Dist	Pos	Fr Node.	H. Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Sept 14		1304	8430	140 26	224 58	118 11	−17 36	182
16	258 496	5	9017	313 59	344 2	211 19	+20 38	179
		6	8257	310 25	335 0	202 17	+17 9	179
		7	6721	240 19	305 5	172 22	−26 34	180
		8	5684	325 11	310 57	178 14	+22 52	181
		9	3978	344 36	295 15	162 32	+24 31	181
		1310	5815	157 20	252 43	120 0	−16 54	182
		1	6175	156 18	250 14	117 31	−18 4	182
17	259 489	2	9804	313 18	0 9	213 21	+19 39	179
		3	9256	310 35	348 37	201 49	+17 25	179
		4	7711	250 51	318 28	171 40	−26 41	180
		5	7193	319 46	324 48	178 0	+22 50	181
		6	5494	330 22	309 20	162 32	+24 51	181
		7	4617	176 31	266 57	120 9	−17 4	182
		8	4931	172 34	264 9	117 21	−17 49	182
18	260 413	9	8574	257 32	330 39	170 45	−26 44	180
		1320	8334	317 20	337 12	177 18	+22 39	181
		1	6873	323 59	322 10	162 16	+24 55	181
		2	4083	203 54	280 35	120 41	−16 57	182
		3	4217	196 20	277 15	117 21	−17 31	182
20	262 476	4	9838	316 26	4 20	175 10	+22 14	181
		5	5945	253 25	310 33	121 23	−17 0	182
		6	5503	248 47	306 19	117 9	−16 57	182
		7	9266	96 33	214 15	25 5	+19 44	184
		8	9630	94 48	207 20	18 10	+21 19	184
21	263 451	9	7145	266 3	324 2	121 2	−15 1	182
		1330	6911	260 14	320 17	117 17	−17 41	182
		1	8288	96 36	227 50	24 50	+19 14	184
		2	8859	94 44	221 11	18 11	+21 17	184
23	265 474	3	5139	89 20	256 50	25 9	+19 4	184
		4	6232	88 39	249 16	17 35	+21 50	184
24	266 489	5	3015	38 31	282 42	36 37	+23 51	183
		6	3322	75 2	271 31	25 26	+19 1	184
		7	4572	79 10	263 39	17 34	+21 59	184
26	268 471	8	4767	332 21	313 17	39 5	+22 39	183
		9	4183	349 28	304 49	30 37	+26 10	183
		1340	2824	346 9	299 50	25 38	+19 11	184
29	271 458	1	9195	317 39	359 15	42 41	+22 29	183
		2	8188	324 22	345 31	28 57	+26 53	183
30	272 472	3	9819	317 36	13 28	42 31	+22 20	183
		4	9111	323 6	358 33	27 36	+27 17	183
		5	8996	142 42	233 56	262 59	−20 26	185
Oct 1	273 503	6	9692	323 4	10 54	25 20	+27 40	183
2	274 479	7	8553	99 19	235 48	236 23	+17 47	186
		8	9913	97 50	210 56	211 31	+18 59	187
5	277 513	9	7249	96 7	252 3	209 36	+18 57	187
		1350	9859	95 35	216 0	173 33	+21 27	189
6	278 452	1	5788	92 2	265 2	209 15	+19 0	187
		2	9319	95 52	229 27	173 40	+21 20	189
10	282 474	3	3822	332 51	321 38	208 49	+18 47	187
		4	3892	73 34	285 2	172 13	+21 2	189
		5	6059	177 45	283 55	171 6	−26 18	190
		6	7717	160 37	264 11	151 22	−27 48	191

1857	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Oct 10		1357	9115	140 57	241 27	128 38	−19 26	192
13	285 499	8	8476	315 32	3 34	207 50	+19 18	187
		9	4245	335 31	326 19	170 35	+20 57	189
		1360	7628	265 4	349 13	193 29	−19 6	188
		1	5127	170 34	287 22	131 38	−18 57	192
		2	6084	160 18	278 8	122 24	−19 44	192
14	286 471	3	9399	314 59	17 18	207 47	+19 29	187
		4	5849	325 30	339 51	170 20	+21 21	189
		5	4126	193 36	301 17	131 46	−17 54	192
		6	4956	176 25	291 35	122 4	−19 47	192
16	288 507	7	8907	317 29	11 37	173 13	+21 25	189
		8	5225	246 40	329 33	131 9	−18 7	192
		9	4865	226 55	319 21	120 57	−21 27	192
		1370	8953	90 22	245 43	47 19	+25 35	194
17	289 499	1	6564	260 6	343 32	131 4	−18 6	192
		2	5738	245 2	332 23	119 55	−21 22	192
		3	7935	87 37	259 13	46 45	+25 49	194
19	291 594	4	9052	272 49	12 50	130 39	−18 21	192
		5	8204	265 26	0 52	118 41	−21 11	192
		6	5177	182 25	298 51	56 40	−22 59	193
		7	5102	71 19	288 11	46 0	+25 53	194
		8	7089	85 25	269 39	27 28	+25 7	194
20	292 568	9	9679	275 31	25 17	129 17	−18 14	192
		1380	9360	269 2	17 31	121 31	−22 53	192
		1	4817	205 35	312 36	56 36	−23 24	193
		2	4789	198 7	308 44	52 44	−22 56	193
		3	3933	50 53	302 14	46 14	+26 0	194
23	295 546	4	7298	257 16	354 1	55 47	−23 0	193
		5	5687	336 36	344 17	46 3	+26 12	194
		6	5157	347 58	336 46	38 32	+28 40	194
		7	3843	5 3	324 24	26 10	+25 56	194
24	296·482	8	7031	329 2	357 30	45 59	+26 29	194
26	298 465	9	9212	322 29	25 7	45 29	+26 45	194
		1390	9838	82 55	238 16	258 38	+32 45	198
27	299 545	1	3713	290 32	341 24	346 26	+ 2 35	195
		2	3220	288 56	338 22	343 24	+ 2 23	195
		3	9797	140 28	244 49	249 51	−23 32	200
		4	9628	79 45	246 2	251 4	+35 21	198
		5	9849	93 39	238 57	243 59	+22 2	199
28	300 518	6	5762	293 43	355 48	347 2	+ 2 56	195
		7	9229	143 3	258 9	249 23	−23 33	200
		8	9035	77 29	259 13	250 27	+35 39	198
		9	9342	93 23	251 42	242 56	+21 53	199
30	302 492	1400	8951	266 52	21 23	344 37	−22 32	196
		1	7120	154 32	286 11	249 25	−23 30	200
		2	7838	146 53	277 20	240 34	−21 30	200
		3	6636	65 37	291 22	254 36	+33 47	198
		4	7202	89 7	278 44	241 58	+21 18	199
		5	7822	87 52	273 22	236 36	+23 34	199
Nov 1	304 568	6	7448	261 25	6 32	300 19	−20 49	197
		7	7781	266 49	11 8	304 55	−18 16	197
		8	5040	185 50	314 39	248 26	−24 19	200
		9	5500	166 37	303 34	237 21	−21 47	200

1857	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Nov 1		1410	7182	149 13	285 46	219 33	−20 53	200
		1	4176	68 34	306 41	240 28	+21 19	199
8	311 564	2	9607	269 21	42 41	237 14	−21 36	200
		3	6789	145 57	294 53	129 26	−18 51	201
9	312 456	4	5505	155 32	307 28	129 22	−18 51	201
11	314 476	5	3701	203 46	335 15	128 30	−18 32	201
15	318 490	6	8311	266 51	31 26	127 45	−18 29	201
		7	5419	165 23	318 32	54 51	−23 29	203
		8	5741	160 11	314 25	50 44	−23 9	203
		9	6494	73 42	304 8	40 27	+25 24	204
		1420	7300	80 21	295 40	31 59	+23 53	204
18	321 520	1	5405	240 7	3 36	56 56	−22 22	203
		2	4856	226 46	355 18	48 38	−23 29	203
		3	4089	8 50	346 57	40 17	+25 45	204
		4	3862	33 0	336 28	29 48	+24 17	204
		5	5682	151 34	314 49	8 9	−19 52	205
		6	6988	141 12	302 28	355 48	−19 10	205
		7	8349	87 29	286 56	340 16	+20 13	206
19	322 621	8	9398	251 9	46 9	83 52	−35 10	202
		9	6938	253 34	19 53	57 36	−22 35	203
		1430	6308	246 16	12 37	50 20	−23 56	203
		1	4590	166 47	327 21	5 4	−20 25	205
		2	9472	128 47	273 26	311 9	−16 17	207
22	325 618	3	9362	262 56	52 11	47 24	−23 38	203
		4	5765	142 39	315 51	311 4	−17 0	207
25	328 497	5	3424	220 18	356 30	310 53	−17 0	207
27	330 511	6	6166	257 32	24 37	310 25	−16 51	207
28	331 513	7	7626	263 27	38 35	310 10	−16 59	207
Dec 4	337 493	8	5004	141 22	333 7	159 53	−17 5	208
		9	6995	60 9	323 0	149 46	+29 29	209
5	338 506	1440	9471	161 14	347 30	159 54	−16 42	208
		1	5943	47 22	336 56	149 20	+29 51	209
8	341 486	2	5288	250 25	29 26	159 34	−16 41	208
		3	5548	347 40	17 38	147 46	+29 45	209
11	344 504	4	6301	145 8	334 23	61 42	−26 7	210
19	352 492	5	9527	248 38	83 21	57 22	−28 22	210
		6	9670	254 31	87 18	61 19	−23 6	210
		7	8520	306 10	67 17	41 18	+22 42	211
		8	8321	310 43	63 43	37 44	+25 37	211
		9	7763	315 54	56 20	30 21	+27 12	211
		1450	3753	351 37	19 23	353 24	+19 24	213
		1	3926	13 10	10 48	344 49	+21 18	213
		2	5242	47 7	352 6	326 7	+22 24	214
		3	6688	67 40	335 39	309 40	+18 24	215
		4	7777	70 39	325 55	299 56	+19 48	215
23	356 450	5	8429	283 52	73 45	351 37	+ 5 20	212
		6	6349	317 26	48 1	325 53	+22 53	214
		7	6170	310 26	49 20	327 12	+18 29	214
		8	4353	328 1	33 18	311 10	+17 55	215
29	362 512	9	3513	14 35	18 57	210 50	+17 14	216
31	364 536	1460	4995	317 1	46 54	210 5	+17 41	216
Jan 4	3 520	1	9644	289 42	101 36	208 16	+17 39	216
1858		2	5378	191 4	36 14	142 54	−35 14	217

1858	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Jan 4		1463	7640	120 19	342 35	89 15	−24 51	220
		4	9128	121 3	325 16	71 56	−29 22	220
		5	6478	97 43	348 59	95 39	− 7 29	219
		6	9610	111 40	315 22	62 2	−21 30	220
9	8 635	7	6979	281 15	77 17	111 24	+ 6 20	218
		8	4190	256 16	58 48	92 55	− 8 29	219
		9	4700	214 0	52 18	86 25	−26 4	220
		1470	4600	204 0	47 40	81 47	−28 14	220
		1	4195	176 53	33 56	68 3	−28 45	220
		2	4810	150 46	19 56	54 3	−29 12	220
		3	4608	129 34	12 47	46 54	−21 35	220
11	10 551	4	9348	276 33	104 26	111 22	+ 7 27	218
		5	7641	259 13	86 7	93 3	− 8 36	219
		6	6810	228 31	73 31	80 27	−28 20	220
		7	5385	219 37	60 28	67 24	−27 6	220
		8	4535	197 22	46 46	53 42	−29 13	220
		9	3962	189 27	41 51	48 47	−26 53	220
		1480	3032	186 46	39 31	46 27	−21 33	220
12	11 510	1	8872	258 48	99 54	93 14	− 8 47	219
		2	7962	233 28	86 35	79 55	−28 29	220
		3	8438	236 50	92 36	85 56	−27 6	220
		4	6703	229 23	74 9	67 29	−27 14	220
		5	5483	214 59	60 17	53 37	−29 18	220
		6	4744	212 16	55 21	48 41	−26 40	220
		7	3905	217 5	53 5	46 25	−21 21	220
		8	5184	203 22	53 15	46 35	−31 36	220
13	12 473	9	9649	257 56	113 17	92 57	− 8 55	219
		1490	9295	238 37	105 57	85 37	−27 0	220
		1	8951	235 48	100 8	79 48	−28 51	220
		2	7766	232 33	85 31	65 11	−28 19	220
		3	6733	225 3	74 1	53 41	−29 43	220
		4	5940	225 2	68 19	47 59	−26 42	220
		5	5358	231 35	66 32	46 12	−21 29	220
		6	6192	218 18	67 18	46 58	−31 3	220
		7	9573	64 6	328 9	307 49	+19 24	222
14	13 470	8	9596	236 40	112 50	78 22	−28 54	220
		9	7953	231 20	88 13	53 45	−29 29	220
		1500	7272	232 14	82 4	47 36	−26 49	220
		1	6898	238 41	80 34	46 6	−21 31	220
		2	7692	224 59	83 28	49 0	−33 12	220
		3	8095	51 58	352 8	317 40	+23 26	222
		4	9338	58 52	334 36	300 8	+22 49	222
17		5						
18	17 570	6	7266	238 18	88 14	355 36	−21 34	221
		7	6894	235 51	84 36	351 58	−22 25	221
19	18 529	8	8071	239 13	97 3	350 49	−22 10	221
		9	4554	32 55	26 55	280 41	+15 36	2 3
		1510	9800	47 18	332 8	225 54	+33 35	224
21	20 490	1	8602	37 49	359 10	225 7	+33 29	224
22	21 581	2	7730	28 45	13 43	224 12	+33 39	224
23	22 512	3	6908	16 50	27 43	225 0	+33 25	224
		4	7342	22 10	21 33	218 50	+34 11	224
24	23 482	5	6416	1 59	41 2	224 33	+33 27	224

1868	Day	No	Dist.	Pos	Tr Nodo	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Jan 24		1516	6634	6 19	37 13	220 44	+34 16	224
		7	8099	108 14	357 3	180 34	−25 9	225
25	24 556	8	6358	344 26	55 9	223 26	+33 31	224
		9	6497	349 26	51 23	219 40	+34 47	224
		1520	9254	98 46	342 31	150 48	−19 2	226
26	25 644	1	6790	327 8	70 0	222 51	+33 15	224
		2	6797	332 20	66 9	219 0	+34 46	224
		3	7925	100 0	359 51	152 42	−19 14	226
27	26 510	4	7401	316 39	81 16	221 50	+33 18	224
		5	7341	319 45	78 44	219 18	+34 19	224
		6	6547	102 45	13 6	153 40	−19 18	226
		7	7359	101 52	6 16	146 50	−20 8	226
28	27 509	8	8247	307 14	94 49	221 13	+33 28	224
		9	8143	310 16	91 57	218 21	+34 45	224
		1530	4754	109 40	28 0	154 24	−19 8	226
		1	5901	104 58	19 24	145 48	−19 38	226
31	30 491	2	9867	294 43	130 31	214 37	+34 44	224
		3	3258	212 15	70 31	154 37	−19 15	226
		4	6894	43 34	20 0	104 6	+18 3	227
		5	9512	107 15	344 13	68 19	−29 41	229
Feb 1	31 511	6	5008	229 21	85 22	155 0	−19 0	226
		7	5263	28 15	36 36	106 14	+17 45	227
		8	8710	108 1	358 25	68 3	−29 24	229
5	35 511	9	6809	286 38	98 56	111 50	+15 17	227
		1540	6225	294 43	92 10	105 4	+17 27	227
		1	4090	145 23	52 21	65 15	−28 40	229
		2	4260	122 58	43 16	56 10	−24 6	229
		3	5562	118 10	34 11	47 5	−27 30	229
8	38 570	4	5826	212 41	94 13	63 43	−28 35	229
		5	4752	212 35	87 31	57 1	−24 32	229
		6	4528	201 37	82 34	52 4	−27 31	229
		7	4197	190 4	76 35	46 5	−28 34	229
9	39 551	8	8834	282 0	122 24	77 59	+20 36	228
		9	7128	219 47	107 40	63 15	−28 46	229
		1550	6239	222 33	101 19	56 54	−24 32	229
		1	5423	206 49	90 35	46 10	−29 29	229
18	48 573	2	6609	29 15	43 35	231 12	+20 19	230
		3	6482	96 18	36 5	223 42	−21 17	231
		4	7222	96 50	30 6	217 43	−23 3	231
19	49 647	5	5301	11 57	59 16	231 39	+20 17	230
		6	4687	103 34	51 12	223 35	−20 54	231
		7	5646	103 21	44 54	217 17	−23 31	231
		8	8680	51 29	19 9	191 32	+13 5	232
		9	9679	98 59	359 13	171 36	−28 47	233
22	52 558	1560	3376	205 44	93 54	224 59	−20 24	231
		1	3057	177 57	84 54	215 59	−23 51	231
		2	6982	104 13	38 8	169 13	−28 23	233
28	58 560	3	6215	208 20	118 6	164 3	−29 35	233
		4	4081	358 7	76 58	122 55	+15 26	234
		5	4375	6 42	72 46	118 43	+15 36	234
		6	6840	16 51	57 1	102 58	+26 3	235
		7	7727	35 17	41 51	87 48	+19 49	235
		8	8228	37 14	36 35	82 32	+20 33	235

1858	Day	No	Dist	Pos	Fr Node	H Long	H. Lat	Group
				° ′	° ′	° ′	° ′	
Feb 28		1569	9546	88 33	11 16	57 13	−21 15	239
		1570	9558	94 41	10 59	56 56	−27 6	239
Mar 4	62 526	1	6426	305 7	111 35	101 17	+26 8	235
		2	6516	310 43	108 36	98 18	+28 42	235
		3	5952	311 23	105 55	95 37	+25 19	235
		4	4757	321 28	97 8	86 50	+20 0	235
		5	4382	104 21	67 2	56 44	−21 50	239
		6	5000	110 37	65 10	54 52	−26 29	239
		7	6390	101 12	52 49	42 31	−26 32	239
		8	6779	97 9	48 44	38 26	−25 4	239
	537	9	7544	273 39	133 17	122 50	+14 17	234
		1580	6255	350 36	79 43	69 16	+30 19	238
		1	6651	353 35	76 32	66 5	+32 35	238
		2	9079	34 7	31 38	21 11	+26 13	241
6	64 611	3	9544	264 33	160 56	121 4	+14 17	234
		4	9509	265 36	160 1	120 9	+15 7	234
		5	8568	283 43	141 3	101 11	+26 13	235
		6	8172	290 32	133 44	93 52	+28 59	235
		7	6902	286 2	125 51	85 59	+19 49	235
		8	8527	298 17	132 36	92 44	+36 21	236
		9	8392	301 49	128 46	88 54	+37 37	236
		1590	6775	311 1	111 22	71 30	+30 40	238
		1	7032	16 59	61 4	21 12	+26 22	241
		2	8243	22 48	48 27	8 35	+29 52	241
		3	2709	173 23	95 56	56 4	−22 8	239
		4	3377	164 21	93 58	54 6	−26 38	239
		5	3589	133 40	82 8	42 16	−26 14	239
		6	3717	123 10	78 5	38 13	−24 53	239
		7	6735	88 47	49 43	9 51	−19 50	242
		8	9936	88 59	5 36	325 44	−22 31	243
7	65 646	9	9198	290 40	146 45	92 12	+35 35	236
		1600	8991	294 57	141 14	86 41	+37 27	236
		1	7596	297 35	125 51	71 18	+30 3	238
		2	6050	2 29	75 22	20 49	+26 4	241
		3	7350	12 56	62 18	7 45	+30 9	241
		4	2797	347 39	89 14	34 41	+ 8 43	240
		5	4858	94 54	65 20	10 47	−19 35	242
		6	9347	88 27	22 9	327 36	−22 43	243
		7	9164	283 11	149 47	95 14	+29 12	235
		8	9086	278 15	150 36	96 3	+24 38	235
		9	8184	277 20	140 38	86 5	+19 50	235
		1610	3971	204 10	110 37	56 4	−22 21	239
		1	4195	193 12	108 31	53 58	−26 33	239
		2	3918	188 15	105 24	50 51	−26 26	239
		3	3031	157 54	92 38	38 5	−24 43	239
		4	9331	88 42	22 27	327 54	−22 56	243
8	66 573	5	8467	289 26	138 59	71 17	+30 11	238
		6	8093	293 59	132 51	65 9	+31 2	238
		7	8386	221 47	149 49	82 7	−24 39	237
		8	8287	218 55	148 18	80 36	−26 50	237
		9	5451	215 37	123 26	55 44	−22 28	239
		1620	5453	206 55	121 5	53 23	−26 40	239
		1	5069	204 15	117 49	50 7	−26 26	239

1858	Day	No	Dist	Pos	h Node	II Long	II Lat	Group
				° ′	° ′	° ′	° ′	
Mar 8	584	1622	9696	274 43	163 38	95 46	+24 56	235
		3	9057	272 49	152 54	85 2	+20 2	235
		4	5515	344 39	88 19	20 27	+25 49	241
		5	6629	0 4	75 27	7 35	+30 31	241
		6	5904	354 17	81 39	13 47	+27 5	241
10	68 550	7	9688	222 34	178 41	82 56	−24 23	237
		8	8272	223 24	150 47	55 2	−22 50	239
		9	8045	217 53	147 32	51 47	−26 53	239
		1630	6238	306 34	115 12	19 27	+26 1	241
		1	5750	315 3	108 26	12 41	+25 21	241
		2	9560	86 58	21 2	285 17	−21 52	244
11	69 513	3	9237	224 29	164 24	55 0	−22 36	239
		4	7131	294 4	128 4	18 40	+25 55	241
		5	8498	84 38	37 41	288 17	−19 30	244
		6	8839	87 12	33 40	284 16	−21 58	244
12	70 474	7	8076	285 22	140 46	17 44	+25 46	241
		8	7118	86 8	52 16	289 14	−19 20	244
		9	7763	89 4	46 49	283 47	−22 23	244
		1640	8158	85 59	42 30	279 28	−20 28	244
15	73 480	1	7151	11 51	71 12	265 32	+28 51	245
		2	2372	135 33	95 15	289 35	−19 52	244
		3	3355	120 5	88 4	282 24	−22 44	244
		4	3926	109 1	82 20	276 40	−22 23	244
16	74 590	5	6290	356 39	86 5	264 40	+28 55	245
		6	9089	97 35	41 31	200 6	+21 27	246
		7	2834	191 28	111 29	290 4	−20 4	244
		8	2728	162 48	103 29	282 4	−22 39	244
		9	2361	143 1	98 13	276 48	−20 18	244
		1650	9500	81 1	28 27	207 2	−17 11	247
		1	9670	89 47	24 34	203 9	−25 30	247
19	77 506	2	7499	223 37	152 13	289 26	−20 23	244
		3	6170	217 59	140 23	277 36	−21 46	244
		4						
		5						
		6						
		7						
		8						
		9	6941	83 48	60 41	197 54	−18 8	247
		1660	7558	101 39	58 56	196 9	−31 53	249
20	78 478	1	8714	224 50	166 3	289 29	−20 39	244
		2	7371	223 40	152 4	275 30	−20 4	244
		3	7483	218 39	152 18	275 44	−23 54	244
		4	6439	32 44	70 59	194 25	+14 9	248
		5	5355	87 46	74 5	197 31	−18 2	247
		6	7083	107 3	66 13	189 39	−33 53	249
	487	7	4833	345 0	99 50	223 8	+21 22	246
		8	5166	0 31	91 16	214 34	+20 53	246
		9	3492	100 25	87 52	211 10	−18 20	247
		1670	6268	108 58	73 25	196 43	−31 48	249
21	79 512	1	9571	225 15	180 27	289 13	−20 25	244
		2	9007	223 5	170 52	279 38	−22 17	244
		3	8721	220 40	166 51	275 37	−24 8	244
		4	8701	225 19	166 57	275 43	−20 5	244

1858	Day	No	Dist	Pos	Ir Node	H Long	H Lat	Group
				° ′	° ′	° ′	°	
Mar 21		1675	5123	121 8	86 53	195 39	−31 44	249
		6	5876	116 35	80 31	189 17	−33 44	249
	523	7	4880	320 20	113 33	222 10	+21 17	246
		8	4727	332 34	107 11	215 48	+21 11	246
		9	4881	18 52	85 42	194 19	+13 55	248
		1680	2090	140 32	103 8	211 45	−18 31	247
		1	3604	98 45	87 59	196 36	−18 11	247
22	80 527	2	9510	225 21	180 12	274 35	−20 13	244
		3	9540	221 11	180 50	275 13	−24 11	244
		4	5748	299 2	128 4	222 27	+21 27	246
		5	5202	309 6	120 58	215 21	+21 17	246
		6	3771	353 10	100 3	194 26	+14 2	248
	537	7	2700	194 43	117 46	211 59	−18 34	247
		8	2019	135 14	103 13	197 26	−17 47	247
		9	4264	145 16	102 39	196 52	−31 37	249
		1690	4996	131 5	93 27	187 40	−33 51	249
23	81 542	1	6225	290 53	135 20	215 18	+20 44	246
		2	3692	319 34	113 45	193 43	+14 2	248
		3	4420	215 5	132 7	212 5	−18 40	247
		4	2547	188 57	116 57	196 55	−18 47	247
		5	4382	169 59	116 9	196 7	−31 36	249
		6	4702	149 57	105 42	185 40	−34 38	249
24	82 543	7	7689	279 20	151 29	217 15	+21 13	246
		8	6163	222 32	146 12	211 58	−18 35	247
		9	4519	212 56	133 18	199 4	−19 43	247
		1700	4850	183 18	125 10	190 56	−31 30	249
		1	4999	171 39	119 41	185 27	−35 2	249
26	84 501	2	9605	268 51	180 31	218 31	+21 30	246
		3	7927	226 4	163 30	201 30	−18 18	247
		4	2526	191 9	120 20	158 20	−18 10	250
		5	2054	137 45	107 41	145 41	−18 0	250
		6	2543	111 59	100 54	138 54	−17 25	250
27	85 566	7	2753	198 41	123 53	146 47	−17 44	250
		8	2000	169 21	115 23	138 17	−17 42	250
28	86 579	9	4664	218 52	139 21	147 53	−17 17	250
		1710	3208	206 56	128 43	137 15	−17 26	250
29	87 452	1	6298	224 15	152 20	148 29	−17 20	250
April 4	93 579	2	5325	212 24	149 18	58 32	−21 24	251
		3	3050	100 20	105 26	14 40	−16 28	252
11	100 506	4	5763	4 14	108 18	279 17	+24 12	254
		5	2433	172 32	131 43	302 42	−18 58	253
		6	2336	139 51	123 36	294 35	−18 47	253
12	101 500	7	5054	344 54	121 48	278 41	+23 58	254
		8	3299	193 21	140 50	297 43	−20 11	253
		9	2822	187 51	137 32	294 25	−19 2	253
15	104 623	1720	8171	223 31	185 14	297 49	−19 42	253
		1	7736	223 36	180 57	293 32	−19 3	253
		2	5208	14 46	110 5	222 40	+18 2	258
		3	6628	24 38	97 59	210 34	+20 12	258
		4	7259	28 27	91 57	204 32	+20 38	258
		5	6715	84 43	89 55	202 30	−17 53	259
16	105 478	6	9147	225 5	198 10	298 38	−19 24	253
		7	8760	226 28	192 59	293 27	−17 52	253

1858	Day	No	Dist	Pos	Ft Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Apr 16		1728	8738	224 45	192 35	293 3	−19 20	253
		9	8219	211 17	184 22	284 50	−29 36	255
		1730	7857	209 6	179 56	280 24	−30 15	255
		1	6060	16 40	105 43	206 11	+21 33	258
		2	6446	19 0	102 24	202 52	+22 21	258
		3	4900	89 42	104 28	204 56	−17 0	259
18	107 476	4	7102	281 50	170 48	242 55	+21 34	256
		5	4225	325 3	137 49	209 56	+19 23	258
		6	4626	343 50	128 59	201 6	+21 50	258
		7	8649	84 12	74 15	146 22	−19 56	260
19	108 529	8	6332	216 36	171 39	228 50	−21 6	257
		9	6105	212 6	168 53	226 4	−23 6	257
		1740	4952	298 35	152 29	209 40	+18 47	258
		1	4733	315 20	144 15	201 26	+21 28	258
		2	2873	196 54	146 32	203 43	−17 8	259
		3	8002	85 53	82 34	139 45	−20 19	260
20	109 619	4	8041	221 34	188 21	230 4	−21 9	257
		5	7589	217 11	183 11	224 54	−23 37	257
		6	6703	279 45	170 57	212 40	+18 44	258
		7	4759	295 51	153 50	195 33	+17 2	258
		8	6001	89 15	100 58	142 41	−18 44	260
		9	6694	90 27	96 0	137 43	−20 58	260
21	110 521	1750	9096	223 22	202 3	230 58	−21 9	257
		1	7967	272 27	184 30	213 25	+18 40	258
		2	6148	280 42	167 51	196 46	+17 4	258
		3	5487	287 31	161 29	190 24	+17 29	258
		4	4293	98 41	114 54	143 49	−18 31	260
		5	5278	97 57	108 43	137 38	−21 15	260
22	111 517	6	9044	267 47	198 46	213 34	+18 37	258
		7	7594	272 36	182 10	196 58	+17 28	258
		8	2726	123 59	129 23	144 11	−18 18	260
		9	3740	116 47	123 32	138 20	−21 49	260
		1760	9129	83 35	71 51	86 39	−19 21	261
		1	9385	84 3	67 45	82 33	−19 59	261
24	113 515	2	3983	207 56	159 11	145 39	−18 9	260
		3	3518	186 11	151 2	137 30	−21 57	260
		4	6383	89 29	101 58	88 26	−19 8	261
		5	7340	88 46	94 6	80 34	−20 37	261
25	114 529	6	5502	216 53	171 24	143 28	−18 51	260
		7	5051	207 18	166 7	138 11	−22 0	260
		8	4611	99 23	117 1	89 5	−19 16	261
		9	5840	94 58	108 4	80 8	−20 48	261
26	115 512	1770	7060	222 46	185 3	143 11	−18 44	260
		1	6610	217 56	180 31	138 39	−20 58	260
		2	3003	122 58	131 57	90 5	−19 5	261
		3	3427	116 35	128 35	86 43	−19 51	261
		4	4345	106 40	121 22	79 30	−20 54	261
28	117 653	5	9581	227 9	217 16	145 2	−18 39	260
		6	4155	208 50	164 11	91 57	−18 15	261
		7	3623	198 53	158 57	86 43	−19 17	261
		8	3187	177 33	151 5	78 51	−21 19	261
		9	4799	95 4	117 53	45 39	−17 33	262
		1780	8460	28 37	93 57	21 43	+27 37	263

1858	Day	No	Dist	Pos	Fr Node	II Long	II Lat	Group
				° ′	° ′	° ′	° ′	
May 3	122 533	1781	9496	226 2	220 3	78 36	−20 20	261
		2	9373	222 47	217 32	76 5	−23 15	261
		3	7139	225 14	192 33	51 6	−17 29	262
		4	6421	224 30	186 45	45 18	−16 41	262
		5	5249	210 5	175 21	33 54	−21 20	262
		6	4374	205 23	168 56	27 29	−20 5	262
		7	4219	198 57	166 15	24 48	−21 34	262
		8	3203	204 21	162 42	21 15	−15 57	262
		9	2961	195 51	159 44	18 17	−16 49	262
		1790	5193	347 22	141 58	0 31	+26 45	264
		1	5660	356 58	135 19	353 52	+28 9	264
5	124 508	2	5862	307 16	169 5	359 37	+27 14	264
		3	5613	318 3	162 0	352 32	+28 31	264
		4	9285	229 3	218 18	48 50	−17 38	262
		5	8970	229 20	213 41	44 13	−17 4	262
		6	8205	223 11	203 55	34 27	−21 8	262
		7	7448	222 47	196 34	27 6	−19 57	262
		8	7126	219 46	193 10	23 42	−21 21	262
		9	6782	228 12	191 54	22 26	−15 1	262
		1800	6231	225 2	187 14	17 46	−16 2	262
		1	5836	206 15	179 38	10 10	−25 15	262
7	126 591	2	9890	226 50	234 11	35 10	−20 31	262
		3	8147	282 10	199 49	0 48	+25 37	264
		4	8054	285 28	197 34	358 33	+27 35	264
		5	7490	290 17	190 26	351 25	+28 8	264
9	128 540	6	9673	275 34	225 52	359 12	+26 3	264
		7	9333	279 28	217 57	351 17	+28 11	264
10	129 501	8	3659	99 39	136 32	256 14	−13 58	265
		9	4113	98 16	133 42	253 24	−14 49	265
		1810	9506	87 59	83 32	203 14	−20 8	267
13	132 524	1	5608	100 23	127 48	204 38	−19 29	267
		2	7196	94 13	114 31	191 21	−20 4	267
16	135 577	3	6205	288 7	191 59	225 30	+20 45	266
		4	5931	291 3	189 10	222 41	+21 4	266
		5	3449	190 29	171 47	205 18	−19 25	267
		6	3100	184 21	168 50	202 21	−18 35	267
		7	3512	167 44	164 6	197 37	−22 35	267
18	137 629	8	8886	274 40	222 21	226 46	+20 40	266
		9	8537	276 22	217 43	222 8	+21 3	266
		1820	8427	273 53	217 7	221 32	+18 41	266
		1	6564	222 13	200 46	205 11	−19 25	267
		2	7127	85 28	118 23	122 48	−12 27	268
		3	7440	83 41	115 33	119 58	−11 34	268
19	138 551	4	9341	273 24	230 14	221 34	+20 43	266
		5	9552	271 6	234 30	225 50	+19 11	266
		6	6848	221 58	203 40	195 0	−20 25	267
		7	5460	90 12	132 13	123 33	−12 25	268
		8	5992	85 50	127 56	119 16	−10 52	268
		9	9845	92 45	84 10	75 30	−22 30	269
		1830	9697	95 28	88 44	80 4	−24 55	269
21	140 568	1	1936	141 5	161 53	124 36	−12 13	268
		2	2246	119 59	157 7	119 50	−11 30	268
		3	8156	100 35	114 34	77 17	−24 54	269

1858	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	°	
May 21		1834	8451	96 18	110 22	73 5	−22 14	269
23	142 548	5	4307	227 59	191 14	125 52	−11 17	268
		6	3443	222 59	185 28	120 6	−10 54	268
		7	5596	117 27	142 16	76 54	−25 1	269
		8	5813	109 22	138 0	72 38	−22 10	269
		9	6854	103 22	128 45	63 23	−22 21	269
26	145 572	1840	9184	244 7	236 51	128 36	− 8 11	268
		1	4485	191 27	184 10	75 55	−24 10	269
		2	3886	185 23	179 49	71 34	−22 4	269
		3	3825	158 25	168 46	60 31	−23 31	269
		4	5275	130 59	152 23	44 8	−27 44	270
		5	4708	132 50	155 36	47 21	−25 11	270
		6	5792	37 33	140 37	32 22	+18 17	271
		7	6616	38 1	134 54	26 39	+20 58	271
		8	6694	106 15	133 30	25 15	−22 42	272
		9	7087	102 47	129 25	21 10	−21 45	272
29	148 492	1850	7798	224 47	220 49	71 9	−22 33	269
		1	7214	222 5	214 55	65 15	−22 42	269
		2	5037	207 38	195 21	45 41	−21 55	270
		3	3802	175 19	178 3	28 23	−22 36	272
		4	4059	164 20	173 36	23 56	−24 41	272
		5	3686	153 31	169 18	19 38	−22 2	272
		6	6710	95 31	133 17	343 37	−15 8	274
		7	3638	318 29	182 34	32 54	+18 19	271
		8	3543	339 59	174 36	24 56	+19 46	271
30	149 533	9	8947	228 49	235 23	70 57	−22 37	269
		1860	8440	227 26	228 53	64 27	−22 29	269
		1	6568	220 23	210 13	45 47	−21 48	270
		2	4777	203 3	193 11	28 45	−22 21	272
		3	4588	191 3	187 30	23 4	−24 42	272
		4	3914	187 6	183 45	19 19	−21 43	272
		5	4998	295 5	197 32	33 6	+18 27	271
		6	4602	297 45	194 35	30 9	+17 49	271
		7	4606	307 8	191 21	26 55	+20 52	271
		8	3941	310 10	187 32	23 6	+18 20	271
31	150 522	9	9705	230 52	250 1	71 33	−22 50	269
		1870	5272	211 2	199 29	21 1	−21 39	272
		1	5023	205 6	195 58	17 30	−22 49	272
		2	6207	285 21	209 4	30 36	+18 6	271
		3	5943	290 44	205 39	27 11	+20 4	271
		4	9156	90 29	109 52	291 24	−15 1	275
June 3	153 547	5	8835	237 36	238 46	17 23	−15 48	272
		6	9348	233 46	245 38	24 15	−20 16	272
		7	9206	230 2	242 44	21 21	−23 20	272
		8	8928	226 28	237 56	16 33	−25 42	272
		9	7064	214 43	215 4	353 41	−27 33	273
		1880	4454	111 48	156 18	294 55	−15 28	275
		1	5267	100 12	148 48	287 25	−12 54	275
4	154 575	2	9840	233 13	257 42	21 45	−22 15	272
		3	9706	228 6	253 9	17 12	−26 52	272
		4	8426	224 36	232 4	356 7	−25 55	273
		5	8273	220 7	228 56	352 59	−28 53	273
		6	2937	142 24	172 6	296 9	−15 41	275

1858	Day	No	Dist	Pos	Fr Node	II Long	II Lat	Group
June 4		1887	3438	115 0	163 15	287 18	−12 36	275
6	156 519	8	4372	218 6	201 36	298 4	−15 38	275
		9	3552	209 57	195 25	291 53	−14 48	275
		1890	3195	202 30	192 0	288 28	−14 50	275
		1	9383	59 22	112 13	208 41	+16 10	278
7	157 575	2	6147	229 45	216 24	297 53	−16 7	275
		3	5231	227 4	209 44	291 13	−14 53	275
		4	4807	224 41	206 36	288 5	−14 38	275
		5	8358	57 40	126 54	208 23	+16 11	278
		6	8949	57 44	119 55	201 24	+17 17	278
8	158 550	7	7650	236 10	230 26	298 6	−15 50	275
		8	6480	233 7	220 22	288 2	−15 9	275
		9	5148	175 35	187 38	255 18	−30 9	276
		1900	5100	171 48	185 22	253 2	−30 5	276
		1	6971	54 16	141 8	208 48	+16 8	278
9	159 557	2	8842	240 5	244 23	297 46	−15 23	275
		3	7877	238. 1	233 43	287 6	−15 9	275
		4	5312	47 42	155 22	208 45	+15 50	278
12	162 508	5	8807	90 45	125 42	137 13	− 9 51	281
13	163 515	6	7495	93 10	140 6	137 20	− 9 32	281
14	164 517	7	9555	262 39	261 5	244 6	+ 2 55	277
		8	4041	290 58	209 11	192 12	+12 58	278
		9	5872	97 54	154 7	137 8	− 9 31	281
15	165 519	1910	6078	231 47	222 59	191 48	−15 51	279
		1	6559	280 28	228 38	197 27	+13 54	278
		2	5772	281 23	222 49	191 38	+12 53	278
		3	4000	107 15	168 19	137 8	− 9 17	281
16	166 527	4	7300	237 24	234 21	188 52	−15 52	279
		5	8235	277 23	244 42	199 13	+14 20	278
		6	7336	277 35	236 19	190 50	+13 6	278
		7	2225	134 7	182 42	137 13	− 8 57	281
19	169 528	8	5620	243 40	225. 43	137 40	− 8 48	281
		9	6405	287 4	230 26	142 23	+16 56	280
		1920	9190	62 21	127 28	39 25	+18 45	285
		1	9595	60 11	120 26	32 23	+21 28	285
21	171 566	2	8673	251 35	254 17	137 19	− 8 54	281
		3	7206	231 44	236 5	119 7	−20 29	282
		4	3137	348 43	196 34	79 36	+20 2	283
		5	6559	56 46	157 1	40 3	+18 17	285
		6	7723	57 22	147 13	30 15	+20 44	285
		7	8555	98 48	137 55	20 57	−12 25	286
22	172 535	8	9546	253 30	267 55	137 12	− 8 51	281
		9	8394	237 1	249 20	118 37	−20 41	282
		1930	4961	48 5	170 56	40 13	+18 25	285
		1	6353	52 42	160 33	29 50	+20 30	285
		2	8891	58 40	135 9	4 26	+22 49	288
		3	7226	102 46	151 58	21 15	−12 22	286
		4	8882	114 49	138 23	7 40	−26 26	287
		5	8766	105 2	137 25	6 42	−17 45	287
23	173 501	6	4947	152 11	185. 22	40 57	−25 11	284
		7	3481	29 19	184 44	40 19	+18 27	285
		8	4282	29 17	181 29	37 4	+22 22	285
		9	·4910	40 23	174 33	30 8	+21 37	285

1868	Day	No	Dist.	Pos	Hr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
June 23		1940	7876	120 32	152 14	7 49	−26 29	287
		1	8227	117 2	147 31	3 6	−25 19	287
		2	8141	110 40	146 27	2 2	−20 8	287
25	175 666	3	5321	211 13	219 0	43 53	−23 3	284
		4	5369	206 13	216 55	41 48	−24 56	284
		5	3837	211 8	212 37	37 30	−15 39	286
		6	3979	314 39	214 49	39 42	+19 53	285
		7	5699	148 55	182 38	7 31	−28 27	287
		8	5674	143 34	179 51	4 44	−26 40	287
		9	5722	138 36	177 10	2 3	−25 11	287
26	176 547	1950	6433	224 12	231 30	43 54	−22 49	284
		1	6379	219 37	229 12	41 36	−24 54	284
		2	5270	166 41	194 45	7 9	−28 50	287
		3	5144	154 11	188 1	0 25	−26 10	287
		4	5797	140 53	178 34	350 58	−26 12	289
		5	9504	100 36	129 28	301 52	−13 44	291
27	177 617	6	7807	233 37	246 29	43 41	−22 40	284
		7	7632	229 27	243 26	40 38	−24 53	284
		8	4938	164 5	194 31	351 43	−26 15	289
		9	5257	156 14	189 34	346 46	−27 4	289
		1960	8612	103 26	143 27	300 39	−13 47	291
		1	9869	102 11	121 32	278 44	−15 46	292
		2	9828	108 44	123 42	280 54	−22 2	292
29	179 508	3	7822	245 8	251 19	21 43	−14 45	286
		4	6650	219 12	232 50	3 14	−26 48	287
		5	5614	206 46	220 56	351 20	−26 17	289
		6	5350	198 15	215 25	345 49	−26 59	289
		7	8476	288 33	259 14	29 38	+19 59	285
		8	5974	115 11	170 2	300 26	−14 13	291
		9	8574	114 36	148 4	278 28	−22 6	292
		1970	8502	107 7	147 3	277 27	−15 45	292
		1	9299	109 4	137 2	267 26	−19 40	292
30	180 607	2	7546	227 47	244 12	359 0	−26 16	289
		3	6766	222 13	235 49	350 37	−25 58	289
		4	6321	216 1	230 1	344 49	−26 45	289
		5	4193	131 13	185 42	300 30	−14 9	291
		6	6990	112 45	163 4	277 52	−15 23	292
		7	7291	121 12	163 17	278 5	−21 52	292
		8	8261	113 9	151 59	266 47	−19 27	292
		9	9421	100 33	134 39	249 27	−11 38	293
July 1	181 663	1980	7539	226 35	244 22	344 11	−27 14	289
		1	7540	187 47	215 32	315 21	−44 46	290
		2	3058	163 17	200 16	300 5	−14 10	291
		3	5978	131 57	177 24	277 13	−21 57	292
		4	5301	122 41	178 9	277 58	−15 0	292
		5	7016	119 52	165 51	265 40	−19 37	292
		6	8570	103 58	147 37	247 26	−12 21	293
2	182 678	7	8566	233 10	257 49	343 14	−27 21	289
		8	7986	201 16	231 42	317 7	−44 15	290
		9	7910	198 23	228 27	313 52	−44 50	290
		1990	3343	205 28	214 47	300 12	−14 6	291
		1	4795	149 20	191 23	276 48	−21 45	292
		2	3724	144 30	193 26	278 51	−14 58	292

1858	Day	No	Dist	Pos	Fi Node	II Long	II Lat	Group
				° ′	° ′	° ′	° ′	
July 2		1993	3996	139 55	190 56	276 21	−15 14	292
		4	5224	133 8	182 51	268 16	−18 46	292
		5	5469	131 23	180 53	266 18	−19 8	292
		6	8184	113 22	154 36	240 1	−18 30	293
		7	7234	108 52	162 0	247 25	−12 37	293
4	184 527	8	9799	240 11	282 22	341 34	−27 13	289
		9	8996	215 27	255 27	314 39	−43 59	290
		2000	8836	212 30	250 59	310 11	−44 53	290
		1	6110	240 58	241 4	300 16	−13 48	291
		2	4559	200 32	217 49	277 1	−21 42	292
		3	3500	203 58	216 14	275 26	−15 7	292
		4	3919	178 43	207 22	266 34	−19 39	292
		5	5266	138 16	186 4	245 16	−20 23	293
		6	5865	131 13	180 1	239 13	−20 14	293
		7	4191	128 28	188 13	247 25	−12 18	293
		8	9761	111 12	132 28	191 40	−20 55	295
		9	9509	105 7	137 15	196 27	−14 18	295
6	186 487	2010	8780	251 38	268 24	299 47	−14 2	291
		1	6932	233 20	245 57	277 20	−21 25	292
		2	4204	193 17	215 17	246 40	−20 31	293
		3	2915	202 4	215 45	247 8	−12 5	293
		4	4027	174 8	206 54	238 17	−20 0	293
		5	8189	118 10	159 9	190 32	−20 38	295
		6	7462	113 17	164 25	195 48	−14 47	295
		7	8235	111 45	156 58	188 21	−15 47	295
		8	8858	120 22	152 19	183 42	−24 51	295
8	188 651	9	9260	245 51	275 31	276 13	−21 19	292
		2020	6715	233 13	245 59	246 41	−21 0	293
		1	5887	223 35	236 50	237 32	−22 7	293
		2	5446	139 56	189 3	189 45	−20 47	295
		3	6538	137 48	181 57	182 39	−25 14	295
		4	4317	138 56	194 5	194 47	−15 7	295
		5	5091	127 4	186 26	187 8	−14 5	295
		6	8486	125 55	160 29	161 11	−26 51	296
		7	8800	115 28	153 30	154 12	−19 35	296
		8	9146	111 55	147 49	148 31	−17 39	296
		9	9549	102 20	139 52	140 34	− 9 52	297
11	191 475	2030	9653	248 39	285 47	246 25	−21 18	293
		1	4853	209 53	228 4	188 42	−21 24	295
		2	4726	232 1	235 50	196 28	−13 53	295
		3	4088	221 6	229 24	190 2	−14 33	295
		4	3683	188 9	216 23	177 1	−17 22	295
		5	5579	161 16	201 12	161 50	−27 23	296
		6	5020	144 24	195 8	155 46	−19 32	296
		7	6020	114 5	179 42	140 20	− 9 42	297
		8	7338	117 39	170 50	131 28	−15 31	297
		9	7818	116 26	166 23	127 1	−16 6	297
12	192 549	2040	8358	286 25	271 31	216 55	+13 52	294
		1	6115	228 1	242 56	188 20	−21 38	295
		2	6236	242 3	248 43	194 7	−14 56	295
		3	5638	239 33	244 8	189 32	−14 11	295
		4	4718	222 8	233 21	178 45	−17 18	295
		5	4375	214 7	228 56	174 20	−17 47	295

1858	Day	No.	Dist.	Pos	Fr Node	H Long	H. Lat.	Group
July 12		2046	5282	187° 3′	217° 44′	163° 8′	−27° 31′	296
		7	4129	169 58	209 37	155 1	−19 33	296
		8	4155	127 40	194 58	140 22	− 9 54	297
		9	5637	128 48	186 59	132 23	−15 46	297
		2050	6301	125. 33	181 44	127 8	−16 35	297
14	194 512	1	8588	244. 30	270 18	187 51	−21 40	295
		2	[illegible]	[illegible]	272. 44	189. 56	−14 12	295
		3	[illegible]	[illegible]	[illegible]	174 30	−19 8	295
		4	[illegible]	[illegible]	[illegible]	[illegible] 45	−26 30	296
		5	5137	221. 22	230 [illegible]	[illegible] 58	−19 41	296
		6	2661	207. 7	223 6	[illegible] 41	− 9 45	297
		7	3762	182. 51	209 3	156 36	−16 16	297
15	195 320	8	9429	257 6	286 16	189. 32	−14 9	295
		9	9393	248 51	283 58	187 14	−21 37	295
		2060	7550	231 59	256 46	160 2	−26 45	296
		1	6486	235 33	250 32	153 48	−19 55	296
		2	4112	237 10	237 21	140 37	−10 0	297
		3	9780	74. 3	140 12	43 28	+20 16	299
17	197 521	4	9395	243 44	284 14	159. 7	−26 58	296
		5	8920	249 19	278 41	153 34	−20 8	296
		6	7476	257 11	265 56	140 49	− 9 49	297
		7	7862	72. 41	169. [illegible]	44 0	+20 4	299
		8	[illegible]	[illegible]	[illegible]	[illegible] 25	+19 31	299
		9	[illegible]	[illegible]	[illegible]	[illegible] 1	−20 34	298
		[illegible]	[illegible]	[illegible]	210. 7	42. 57	+19 47	299
		[illegible]	4981	60. 24	200. 40	33. 30	+19 11	299
		[illegible]	4995	63. 22	198 9	30. 50	+19 3	299
		[illegible]	[illegible]	[illegible]	178. [illegible]	11. 4	−24. 13	300
		[illegible]	[illegible]	[illegible]	179. [illegible]	[illegible] 5	+20. 26	299
		5	7013	300. 3	276. 44	32. 32	+18 58	299
		6	6162	228 5	252. 48	14 36	−23 26	300
		7	3762	177 19	223 11	344 59	−16 19	301
		8	3900	168 26	219 33	341 21	−16 12	301
		9	8931	128 50	170 10	291 58	−24 15	302
21	201 473	2080	5592	237 6	258 57	281 45	−17 29	303
		1	4838	230 14	252 35	275 23	−16 25	303
		[illegible]	[illegible]	[illegible]	223 25	246. 13	−21 15	304
		[illegible]	[illegible]	[illegible]	[illegible] 54	244. 34	−21 28	304
		[illegible]	[illegible]	[illegible]	[illegible] 42	[illegible] 22	−16. 24	306
		[illegible]	[illegible]	[illegible]	[illegible] 20	[illegible] 2	−17. 31	305
		[illegible]	[illegible]	[illegible]	[illegible] 38	[illegible] 18	−17. 22	304
		[illegible]	[illegible]	[illegible]	236. 34	[illegible] 14	−19. 16	305
		[illegible]	[illegible]	[illegible]	240. [illegible]	[illegible] 18	−17. 28	306
		[illegible]	[illegible]	[illegible]	[illegible] 32	[illegible] 12	−21 12	305
		[illegible]	[illegible]	[illegible]	[illegible] 56	[illegible] 36	+14 53	303
		[illegible]	[illegible]	[illegible]	[illegible] 47	[illegible] 27	+15 12	303
		[illegible]	[illegible]	[illegible]	[illegible] 16	[illegible] 56	−17 48	302
		[illegible]	[illegible]	[illegible]	[illegible] 32	[illegible]	−[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	180. 29	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	172. 5	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	173. [illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+16. 3	[illegible]

1858.	Day	No.	Dist.	Pos.	Hr. Node.	H. Long.	H. Lat.	Group
Aug. 15	226 475	2099	6225	217° 27′	262° 26′	86° 38′	−28° 56′	307
		2100	4345	59. 8	258. 38	52. 48	+22. 46	310
		1	5467	82. 29	260. 5	55. 5	+18. 25	310
		2	6688	77. 34	260. 0	50. 0	+23. 48	310
		3	7421	80 51	260 57	25. 7	+23 6	310
19	230 597	4	7416	277 11	298 18	64 1	− 3 1	308
		5	8131	236 44	289 33	55 16	−33. 43	309
		6	7826	229 45	282 17	48 0	−35 35	309
		7	3461	168 45	241 49	7 32	−10 52	311
		8	2291	130 10	239 24	5 7	+ 1 38	312
		9	4160	315 53	274. 4	39. 47	+17 38	310
		2110	3471	328 55	267 34	"33. 17	+19 44	310
		1	3015	357 32	257. 59	23. 42	+23. 8	310
		2	7442	81. 59	264. 45	330. 28	+23 33	313
22	233 567	3	[illegible]	[illegible]	[illegible]	[illegible]	−35. 20	309
		4	[illegible]	[illegible]	[illegible]	[illegible]	−32. 45	309
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+26. [illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		2126	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	234 697	1	[illegible]	351. 34	332. 48	[illegible]	[illegible]	309
		2	[illegible]	[illegible]	334. 27	42. 6	+16. 16	310
		[illegible]	[illegible]	[illegible]	330. 58	38. 11	+18. 27	310
		[illegible]	[illegible]	[illegible]	[illegible]	37. 52	+24. 26	310
		[illegible]	[illegible]	[illegible]	[illegible]	284. 22	−17. 46	315
		[illegible]	6316	136. 34	302. 26	269 59	−19. 18	315
		[illegible]	9036	133 41	195. 39	263. 14	−18. 33	315
		[illegible]	6589	92. 46	214. 38	284. 11	+13. 46	312
		[illegible]	[illegible]	93. 22	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1858	Day	No	Dist	Pos	Fi Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
July 12		2046	5282	187 3	217 44	163 8	−27 31	296
		7	4129	169 58	209 37	155 1	−19 33	296
		8	4155	127 40	194 58	140 22	− 9 54	297
		9	5637	128 48	186 59	132 23	−15 46	297
		2050	6301	125 33	181 44	127 8	−16 35	297
14	194 512	1	8533	244 36	270 18	187 51	−21 40	295
		2	8503	253 41	272 23	189 56	−14 12	295
		3	7230	241 29	257 17	174 50	−19 8	295
		4	6611	223 27	245 12	162 45	−26 30	296
		5	5127	221 22	236 25	153 58	−19 41	296
		6	2661	207 7	223 8	140 41	− 9 45	297
		7	3762	162 51	209 3	126 36	−16 16	297
15	195 520	8	9429	257 6	286 16	189 32	−14 9	295
		9	9393	248 51	283 58	187 14	−21 37	295
		2060	7550	231 59	256 46	160 2	−26 45	296
		1	6486	235 33	250 32	153 48	−19 55	296
		2	4112	237 10	237 21	140 37	−10 0	297
		3	9750	74 3	140 12	43 28	+20 16	299
17	197 521	4	9395	243 44	284 14	159 7	−26 58	296
		5	8920	249 19	278 41	153 34	−20 8	296
		6	7476	257 11	265 56	140 49	− 9 49	297
		7	7862	72 41	169 7	44 0	+20 4	299
		8	8875	75 5	157 32	32 25	+19 31	299
20	200 485	9	4347	178 35	219 11	52 1	−20 34	298
		2070	3310	44 11	210 7	42 57	+19 47	299
		1	4361	60 24	200 40	33 30	+19 11	299
		2	4695	63 22	198 0	30 50	+19 3	299
		3	7911	132 4	178 14	11 4	−24 13	300
25	205 493	4	7990	299 53	279 35	41 23	+20 26	299
		5	7015	300 1	270 44	32 32	+18 58	299
		6	6162	228 5	252 48	14 36	−23 20	300
		7	3762	177 19	223 11	344 59	−16 19	301
		8	3900	168 26	219 33	341 21	−16 12	301
		9	8931	128 50	170 10	291 58	−24 15	302
Aug 1	212 473	2080	5592	237 6	258 57	281 45	−17 29	303
		1	4838	230 14	252 35	275 23	−16 25	303
		2	4871	170 12	223 25	246 13	−21 15	304
4	215 468	3	6322	236 39	265 15	245 34	−21 28	304
		4	5359	146 33	213 30	193 49	−16 24	306
		5	5927	143 15	209 7	189 26	−17 31	306
7	218 504	6	9455	258 9	306 23	243 38	−21 22	304
		7	4823	228 9	256 33	193 48	−17 18	306
		8	4384	217 7	250 30	187 45	−17 28	306
		9	4637	198 17	242 19	179 34	−21 11	306
		2090	3738	308 23	260 18	197 33	+14 53	305
		1	3201	313 37	256 27	193 42	+15 12	305
8	219 513	2	6292	244 54	271 42	194 38	−17 49	306
		3	5566	237 25	264 35	187 31	−17 56	306
		4	5318	224 7	257 33	180 29	−21 12	306
		5	5151	218 30	254 13	177 9	−21 41	306
		6	4472	225 4	254 48	177 44	−16 17	306
		7	6063	298 34	277 50	200 46	+13 55	305
		8	4993	305 22	269 36	192 32	+16 5	305

1858	Day	No	Dist	Pos	Fr Nodo	H Long	H Lat.	Group
Aug 15	226 475	2099	6225	217° 27′	262° 26′	86° 36′	−28° 56′	307
		2100	4345	59 8	228 38	52 48	+22 46	310
		1	5467	82 19	215 55	40 5	+18 25	310
		2	6688	77 34	207 50	32 0	+23 48	310
		3	7421	80 51	200 57	25 7	+23 6	310
19	230 597	4	7416	277 11	298 18	64 1	− 3 1	308
		5	8131	236 44	289 33	55 16	−33 43	309
		6	7826	229 45	282 17	48 0	−35 35	309
		7	3461	168 45	241 49	7 32	−10 52	311
		8	2291	130 10	239 24	5 7	+ 1 38	312
		9	4160	315 53	274 4	39 47	+17 38	310
		2110	3471	328 55	267 34	33 17	+19 44	310
		1	3015	357 32	257 59	23 42	+23 8	310
		2	7442	81 50	204 45	330 28	+23 33	313
22	233 567	3	9559	248 7	317 27	41 2	−35 20	309
		4	9923	254 2	331 3	54 38	−32 49	309
		5	8774	304 25	316 16	39 51	+17 14	310
		6	8056	307 54	308 1	31 36	+19 39	310
		7	7329	314 11	300 16	23 51	+23 21	310
		8	8646	314 46	313 54	37 29	+26 5	310
		9	8791	132 56	197 31	281 6	−17 36	315
		2120	9784	129 40	179 53	263 28	−18 57	315
23	234 697	1	9946	251 54	332 43	40 16	−35 27	309
		2	9772	303 57	334 27	42 0	+16 10	310
		3	9612	306 7	330 38	38 11	+18 27	310
		4	9022	312 41	320 19	27 52	+24 26	310
		5	7457	140 23	213 49	281 22	−17 46	315
		6	8546	136 34	202 26	269 59	−19 18	315
		7	9036	133 41	195 39	263 12	−18 53	315
		8	6583	92 40	214 38	282 11	+15 50	314
		9	6895	93 28	212 4	279 37	+15 36	314
26	237 571	2130	4179	187 50	253 12	280 0	−17 2	315
		1	4976	172 23	244 23	271 11	−19 20	315
		2	5968	164 54	236 45	263 33	−22 44	315
		3	5919	157 22	233 25	260 13	−19 31	315
		4	8017	143 45	212 50	239 38	−21 47	316
		5	9493	129 14	190 0	216 48	−16 1	317
		6	9695	97 56	181 35	208 23	+13 5	318
		7	2180	12 21	260 1	286 49	+19 27	314
		8	1917	19 37	258 21	285 9	+18 1	314
Sept 5	247 533	9	7969	303 40	321 15	206 44	+13 24	318
		2140	6141	261 46	300 41	186 10	−12 5	319
		1	5755	251 3	294 41	180 10	−15 49	319
		2	4581	225 41	279 2	164 31	−17 43	320
		3	4473	217 37	275 11	160 30	−18 20	320
		4	4345	203 1	268 23	153 52	−18 28	320
		5	5705	182 42	255 54	141 23	−25 23	321
		6	3103	86 45	251 19	136 48	+14 31	322
8	250 562	7	9782	276 58	346 27	188 58	−13 53	319
		8	9347	276 12	337 25	179 56	−12 48	319
		9	8256	264 42	320 53	163 24	−18 24	320
		2150	7124	257 12	308 33	151 4	−18 53	320
		1	6891	242 49	300 15	142 46	−25 36	321

1858	Day	No	Dist	Pos	Ft Node	II Long	II Lat	Group
Sept 8		2152	6538	239° 15′	296° 16′	138° 47′	−25° 13′	321
		3	4264	194 20	267 12	109 43	−17 40	323
		4	4598	183 24	261 44	104 15	−18 30	323
		5	6198	159 22	244 3	86 34	−20 14	324
		6	6636	156 23	240 5	82 36	−20 57	324
		7	9666	151 3	204 41	47 12	−33 58	327
12	254 503	8	8340	267 47	326 21	112 58	−16 59	323
		9	7706	259 37	317 37	104 14	−20 21	323
		2160	6118	248 3	301 45	88 22	−19 31	324
		1	5784	233 16	292 55	79 32	−23 19	324
		2	7047	181 42	256 23	43 0	−33 54	327
		3	7508	170 46	245 56	32 33	−32 44	327
		4	4665	180 16	263 39	50 16	−18 14	326
		5	9113	133 0	212 32	359 9	−14 16	330
		6	9465	131 40	206 43	353 20	−14 23	330
		7	4516	71 57	253 19	39 56	+24 6	328
		8	5568	75 23	245 49	32 26	+26 24	328
		9	6040	79 33	241 19	27 56	+25 45	328
15	257 572	2170	7599	325 4	325 14	68 19	+27 46	325
		1	7143	331 27	319 17	62 22	+30 56	325
		2	4144	339 2	296 33	39 38	+23 38	328
		3	3736	357 41	288 36	31 41	+26 25	328
		4	7032	226 51	296 46	39 51	−33 38	327
		5	6730	213 51	285 41	28 46	−34 22	327
		6	5048	159 5	256 19	359 24	−14 11	330
		7	7418	182 57	258 15	1 20	−36 54	329
		8	9450	145 18	213 35	316 40	−26 13	331
24	266 375	9	8593	262 34	338 20	316 33	−23 38	331
		2180	7985	252 51	327 56	306 9	−27 36	331
		1	5112	213 43	291 7	269 20	−23 25	332
		2	4462	209 34	288 29	266 42	−19 27	332
		3	6329	196 8	279 39	257 52	−31 40	332
		4	9538	133 14	216 58	195 11	−14 34	333
26	268 558	5	6444	253 45	319 10	266 26	−19 37	332
		6	7283	143 24	247 4	194 20	−14 41	333
		7	7920	135 44	239 33	186 49	−11 18	333
		8	8369	138 46	236 2	183 18	−15 2	333
		9	9776	138 2	214 38	161 54	−20 2	334
		2190	9650	135 55	217 18	164 34	−17 23	334
Oct 1	273 419	1	4839	247 39	312 51	191 10	−14 57	333
		2	3925	242 24	307, 12	185 31	−11 59	333
		3	3524	225 50	300 30	178, 49	−12 46	333
		4	5205	96 59	262 59	141 18	+15 28	335
		5	8536	140 28	239 24	117 43	−16 47	337
	273 430	6	4219	189 11	286, 11	164 20	−17 11	334
		7	3882	179, 59	283 26	161 35	−13 50	334
		8	4706	183, 26	282, 30	160 39	−19 10	334
		9	5052	177 4	278 30	156 39	−19 45	334
		2200	5742	162 4	268, 46	146 55	−18 20	334
		1	6934	164, 43	263 5	141 14	−25 36	336
		2	8556	140 13	239 7	117 16	−16 40	337
		3	9334	140 28	229 1	107 10	−19 53	337
		4	8559	138 30	238 37	116 46	−15 16	337

1858	Day	No	Dist	Pos	Fr Node.	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Oct 3	275 435	2205	5047	253 13	317 48	167 31	−14 5	334
		6	5058	244 29	314 35	164 18	−17 12	334
		7	4397	239 53	310 5	159 48	−15 7	334
		8	5035	236 36	311 7	160 50	−19 24	334
		9	4741	230 23	307 20	157 3	−19 11	334
		2210	4540	217 29	300 55	150 38	−19 53	334
		1	4194	209 51	297 7	146 50	−18 10	334
		2	5414	197 41	290 25	140 8	−25 47	336
	275 450	3	7935	272 3	343 48	193 18	−14 39	333
		4	7249	268 45	337 3	186 33	−14 41	333
		5	6310	266 43	329 39	179 9	−12 43	333
		6	1753	51 6	291 10	140 40	+15 34	335
		7	5776	158 23	269 3	118 33	−16 56	337
		8	5917	153 42	266 31	116 1	−15 23	337
		9	7375	149 40	255 5	104 35	−19 2	337
10	282 449	2220	9348	275 19	8 13	118 26	−17 13	337
		1	7075	329 22	344 9	94 22	+27 9	338
		2	6214	332 59	336 18	86 31	+26 44	338
		3	6432	336 59	336 34	86 47	+29 43	338
		4	4599	239 39	317 41	67 54	−16 41	339
		5	4545	213 20	305 50	56 3	−20 39	339
		6	4561	193 59	296 30	46 43	−20 18	339
		7	4598	184 3	291 52	42 5	−19 6	339
		8	3831	182 53	293 26	43 39	−14 29	339
		9	4371	175 11	288 55	39 8	−15 58	339
		2230	8715	93 7	242 9	352 22	+23 11	341
		1	9334	92 35	233 7	343 20	+24 22	341
17	289 603	2	5587	330 50	339 29	348 14	+23 16	341
		3	4763	335 28	333 2	341 47	+22 34	341
		4	4683	351 33	327 2	335 47	+27 51	341
		5	7623	252 55	348 2	356 47	−27 7	340
		6	7605	242 0	341 39	350 24	−33 19	340
		7	7277	235 5	334 44	343 29	−34 27	340
		8	3320	166 59	297 22	306 7	− 9 26	344
		9	4853	177 34	295 21	304 6	−19 45	345
		2240	5874	170 41	287 52	296 37	−23 20	345
21	293 476	1	9735	319 3	31 0	344 49	+23 41	341
		2	7320	265 10	354 43	308 32	−18 2	345
		3	6677	256 53	346 56	300 45	−20 27	345
		4	6429	248 36	341 43	295 32	−23 32	345
		5	3852	221 28	319 36	273 25	−16 30	346
		6	3778	212 12	315 55	269 44	−16 45	346
		7	4706	193 7	307 1	260 50	−22 1	346
		8	6340	180 36	295 18	249 7	−29 53	347
		9	6330	174 29	291 38	245 27	−27 44	347
		2250	6170	91 29	277 10	230 59	+18 58	348
		1	6762	93 1	272 22	226 11	+19 10	348
29	301 374	2	8580	265 34	14 59	216 46	−22 16	349
		3	5949	260 28	351 48	193 35	−15 47	350
		4	4899	250 8	342 24	184 11	−15 57	350
		5	3246	222 50	327 10	168 57	−13 27	351
		6	3797	196 42	318 2	159 49	−17 29	351
		7	2197	31 12	319 55	161 42	+17 3	352

1858	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Oct 29		2258	7842	99 2	270 8	111 55	+15 16	353
		9	8589	95 4	262 42	104 29	+19 23	353
31	303 487	2260	8707	273 55	20 57	192 46	−15 40	350
		1	8423	272 50	17 33	189 22	−15 45	350
		2	6156	249 36	351 17	163 6	−21 58	351
		3	5453	252 2	348 14	160 3	−17 43	351
		4	4825	324 16	349 26	161 15	+17 35	352
		5	4081	86 31	301 40	113 29	+15 2	353
		6	5748	84 51	291 29	103 18	+20 12	353
Nov 7	310 482	7	9562	308 6	43 30	116 6	+15 8	353
		8	9274	309 33	38 18	110 54	+16 20	353
		9	5255	152 35	305 28	18 4	−16 8	355
		2270	5927	148 9	300 2	12 38	−16 38	355
		1	7148	136 27	288 3	0 39	−13 37	355
		2	7657	134 41	283 23	355 59	−13 43	355
		3	3947	51 6	318 54	31 30	+23 50	354
		4	9048	89 0	266 41	339 17	+23 28	357
11	314 613	5	5996	260 32	6 24	20 24	−15 45	355
		6	4920	250 9	356 47	10 47	−16 22	355
		7	3813	243 59	349 36	3 36	−13 30	355
		8	2927	227 52	341 57	355 57	−12 11	355
		9	5184	216 27	342 41	356 41	−27 0	356
		2280	5189	210 47	339 28	353 28	−27 40	356
		1	3937	50 14	323 4	337 4	+23 18	357
		2	8035	142 27	286 20	300 20	−21 38	358
		3	9131	140 58	273 4	287 4	−24 25	358
		4	9009	74 39	274 23	288 23	+34 58	359
12	315 468	5	7238	267 26	18. 14	20 6	−15 23	355
		6	6152	261 30	8 39	10 31	−15 43	355
		7	5150	258 48	1 36	3 28	−13 42	355
		8	4110	253 2	354 23	356 15	−12 8	335
		9	5743	232 46	354 27	356 19	−26 40	356
		2290	3491	23 34	334 54	336 46	+23 19	557
		1	6759	148 12	299 46	301 38	−20 56	358
21	324 502	2	9177	252 23	44 37	278 21	−32 38	360
		3	8208	328 38	33 16	267 0	+32 22	361
		4	6600	228 24	6 50	240 34	−33 23	362
		5	3988	153 5	327 11	200 55	−14 5	363
28	331 605	6	9057	270 9	55 3	188. 2	−14 46	363
		7	7480	253 7	34 11	167 10	−23 50	364
		8	3656	28 19	347 14	120 13	+21 58	365
		9	3882	37 50	343 6	116 5	+22 14	365
		2300	3032	49 46	341 52	114 51	+15 45	365
		1	2815	171 10	344 24	117 23	−13 34	366
		2	4706	150 33	330. 42	103 41	−17 50	366
		3	5671	145 5	323 28	96 27	−19 26	366
		4	7361	137 20	308 54	81 53	−20 56	367
		5	8503	136 7	297 33	70 32	−23 43	367
Dec 5	338 494	6	9652	265 48	72 16	107 32	−17 48	366
		7	8728	262 51	57 16	92 32	−18 31	366
		8	7814	257 15	46 24	81 40	−20 39	367
		9	7090	248 44	37 35	72 51	−24 9	367
		2310	6610	246 3	33 0	68 16	−23 57	367

1858	Day	No	Dist	Pos	Ir Node	H Long	H Lat	Group
				° ′	° ′	° ′	°	
Dec 5		2311	4450	359 7	5 58	41 14	+25 30	369
		2	4605	219 32	10 56	46 12	−24. 20	368
		3	2707	179 44	354 31	29 47	−14 56	370
		4	3499	157 0	345 52	21 8	−15 54	370
		5	4169	147 31	340 10	15 26	−16 19	370
		6	5008	142 55	334. 22	9 38	−17 57	370
		7	5546	138 32	329 51	5 7	−17 56	370
19	352 526	8	9282	311 26	76 0	272 13	+29 53	371
		9	5127	307 49	39 50	236 3	+13 15	372
		2320	4090	332 12	27 15	223 28	+17 43	372
		1	2820	217 20	20 55	217 8	−15 45	373
		2	2500	175 20	9 27	205 40	−15 38	373
		3	2971	156 19	3 23	199 36	−16 7	373
		4	3652	152 45	359 53	196 6	−18 48	373
		5	6351	117 52	334 57	171 10	−13 36	374
		6	7253	122 11	328 41	164 54	−18 17	374
22	355 466	7	9235	291 53	81 44	236 15	+13 9	372
		8	8170	294 52	68 29	223 0	+13 31	372
		9	7858	304 6	63 23	217 54	+19 48	372
		2330	7433	257 6	62 11	216 42	−15 46	373
		1	6294	253 24	52 29	207 0	−15 57	373
		2	5239	245 33	43 36	198 7	−17 24	373
		3	2095	182 58	14 54	169 25	−13 57	374
		4	2971	166 22	9 29	164 0	−18 2	374
		5	8672	116 51	316 51	111 22	−18 20	376
		6	9793	113 27	297 36	92 7	−16 45	378
26	359 597	7	7084	309 16	58 38	154 34	+21 41	375
		8	6615	316 19	52 31	148 27	+23 53	375
		9	7607	251 22	67 21	163 17	−19 10	374
		2340	2770	166 54	14 48	110 44	−17 40	376
		1	4826	126 48	354 40	90 36	−17 0	378
27	360 602	2	8201	304 25	70 55	152 35	+22 37	375
		3	7839	308 2	66 13	147 53	+23 58	375
		4	8756	253 31	80 52	162 32	−19 19	374
		5	2879	211 50	28 53	110 33	−17 16	376
		6	3214	144 54	8 40	90 20	−16 50	378
		7	4938	173 31	14 44	96 24	−31 27	377
		8	5145	167 40	10 58	92 38	−31 56	377
		9	9562	68 35	311 2	32 42	+23 35	382
Jan 2 1859	1 521	2350	9890	253 49	108 45	106 28	−17 51	376
		1	9045	254 3	91 14	88 57	−17 1	378
		2	4291	194 54	33 23	31 6	−27 47	380
		3	2996	210 24	35 40	33 23	−18 20	381
		4	2665	181 3	26 49	24 32	−18 38	381
		5	2769	143 23	16 45	14. 28	−15 45	381
		6	8649	117 19	328 49	326 32	−23 55	383
		7	6672	313 1	59 43	57 26	+23 29	379
		8	5639	320 56	50 6	47 49	+22 19	379
		9	5123	334. 2	41 45	39 28	+23 48	382
		2360	4921	346 23	34 57	32 40	+25 2	382
		1	5015	358 29	28 31	26 14	+26 40	382
		2	4811	4 42	25 9	22 52	+25 19	382
9	8 504	3	6175	27 27	13 50	272 30	+28 37	385

1859	Day	No	Dist	Pos	Fi Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Jun 9		2364	2800	175 31	33 16	291 56	−20 11	384
		5	8948	66 40	333 34	232 14	+16 59	387
		6	8240	70 4	340 51	239 31	+12 15	387
		7	9325	69 57	327 28	226 8	+15 11	387
		8	4742	131 4	12 4	270 44	−22 33	386
		9	5331	129 14	8 4	266 44	−24 7	386
		2370	6159	113 42	358 17	256 57	−18 44	386
		1	6726	110 54	353 28	252 8	−18 12	386
		2	7174	110 55	349 50	248 30	−19 5	386
		3	9650	99 54	318 58	217 38	−12 33	389
		4	9866	103 45	312 54	211 34	−16 12	389
14	13 467	5	7915	305 23	81 58	270 14	+27 3	385
		6	7706	312 22	76 42	264 58	+30 29	385
		7	3441	317 40	51 27	239 43	+11 15	387
		8	3769	342 22	44 12	232 28	+16 55	387
		9	7145	239 5	82 24	270 40	−21 52	386
		2380	5778	239 11	72 0	260 16	−18 40	386
		1	4436	222 37	59 24	247 40	−21 47	386
		2	4225	161 22	32 16	220 32	−28 34	388
		3	2335	125 39	28 31	216 47	−13 3	389
		4	3104	124 13	24 32	212 48	−15 30	389
16	15 564	5	9522	243 30	113 37	272 8	−21 32	386
		6	8711	246 2	101 27	259 58	−18 29	386
		7	7630	241 11	89 28	247 59	−20 48	386
		8	9421	299 5	104 56	263 27	+30 9	385
		9	9577	294 19	109 30	268 1	+26 37	385
		2390	6805	286 6	81 8	239 39	+10 46	387
		1	6265	299 28	73 33	232 4	+16 55	387
		2	5465	317 48	61 41	220 12	+21 25	387
		3	4288	232 34	63 28	221 59	−17 29	389
		4	3172	237 34	55 56	214 27	−12 48	389
		5	2779	220 23	53 3	211 34	−15 46	389
		6	3285	144 7	30 55	189 26	−21 1	390
		7	8324	100 46	345 6	143 37	−16 1	391
		8	8861	59 34	342 57	141 28	+19 33	392
20	19 508	9	9903	280 12	125 0	227 35	+16 22	387
		2400	9754	245 30	123 9	225 44	−17 59	389
		1	9183	244 54	112 0	214 35	−18 26	389
		2	9216	250 26	112 38	215 13	−13 23	389
		3	5790	37 53	19 31	122 6	+19 27	392
		4	2118	148 6	39 55	142 30	−16 7	391
		5	7041	113 56	3 37	106 12	−25 8	393
		6	6667	105 12	4 47	107 22	−18 34	393
		7	7604	99 47	356 10	98 45	−16 10	393
		8	8721	99 55	344 34	87 9	−17 23	393
		9	9947	106 50	319 39	62 14	−24 22	394
Feb 3	33 481	2410	9537	284 31	126 49	31 13	+24 2	395
		1	2924	310 18	69 28	333 52	+ 7 27	396
		2	2487	333 53	62 37	327 1	+ 7 48	396
		3	3330	138 15	49 29	313 53	−23 1	397
		4	5816	9 50	44 46	309 10	+26 15	398
		5	7124	101 37	15 26	279 50	−21 50	399
		6	9017	95 1	354 40	259 4	−19 3	401

1859	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Feb 3		2417	8918	42 10	4 10	268 34	+26 59	400
		8	8690	44 17	6 8	270 32	+24 12	400
24	54 542	9	5878	229 12	115 57	81 36	−17 36	402
		2420	5738	242 10	115 56	81 35	−10 3	402
		1	4428	235 17	106 46	72 25	−12 38	402
		2	3333	199 5	93 55	59 34	−21 44	403
		3	2525	215 5	93 11	58 50	−15 6	403
		4	2134	195 56	88 21	54 0	−16 52	403
		5	2987	179 25	87 5	52 44	−23 17	403
		6	3308	84 14	61 49	27 28	−11 28	404
		7	4666	84 36	53 21	19 0	−13 12	404
		8	7204	68 12	34 47	0 26	− 3 54	405
		9	8216	87 18	25 22	351 1	−18 31	406
		2430	8709	85 15	19 43	345 22	−17 4	406
		1	8961	56 37	19 5	344 44	+ 8 18	407
		2	9568	59 41	9 11	334 50	+ 7 18	407
Mar 3	61 678	3	5751	269 57	120 16	344 41	+ 6 28	407
		4	4517	279 54	110 35	335 0	+ 7 15	407
		5	3804	290 12	104 24	328 49	+ 7 57	407
		6	5527	227 57	120 46	345 11	−16 48	406
		7	5189	25 35	64 47	289 12	+13 45	408
		8	8934	84 38	24 4	248 29	−18 16	411
6	64 512	9	9409	256 19	159 43	343 56	+ 6 6	407
		2440	8765	259 29	150 18	334 31	+ 7 12	407
		1	4208	302 12	105 7	289 20	+13 10	408
		2	3553	337 42	90 39	274 52	+13 33	408
		3	7938	34 58	45 23	229 36	+19 58	412
		4	8390	39 42	39 23	223 36	+18 18	412
		5	7859	39 1	44 49	229 2	+16 42	412
		6	7725	46 55	43 31	227 44	+10 37	412
		7	9386	52 51	23 18	207 31	+10 41	413
		8	7159	357 56	72 49	257 2	+35 3	409
8	66 521	9	7061	273 18	133 6	288 50	+12 58	408
		2450	5487	12 9	73 12	228 56	+19 43	412
		1	4670	321 5	100 31	256 15	+19 31	410
		2	7151	43 25	51 3	206 47	+11 4	413
	66 531	3	5458	11 58	73 26	229 1	+19 37	412
		4	5916	21 12	67 5	222 40	+18 26	412
		5	7138	43 38	51 6	206 41	+10 53	413
		6	6670	46 50	53 49	209 24	+ 7 31	413
9	67 486	7	8264	267 11	146 4	288 6	+12 37	408
		8	4658	351 2	86 46	228 48	+19 35	412
		9	4879	3 40	80 19	222 21	+18 40	412
		2460	5712	34 42	64 19	206 21	+11 15	413
	67 499	1	4673	350 52	86 49	228 41	+19 42	412
		2	4856	3 28	80 30	222 22	+18 35	412
		3	5057	33 29	68 31	210 23	+ 9 29	413
		4	9584	79 27	19 30	161 22	−14 25	415
	67 540	5	5549	299 40	114 30	256 22	+19 36	410
		6	4676	349 24	87 34	229 26	+19 53	412
		7	4140	76 33	69 32	211 24	−10 40	414
		8	9756	85 54	15 8	157 0	−20 27	415
10	68 629	9	9431	262 54	162 51	288 41	+13 3	408

1859	Day	No	Dist	Pos	Fi Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Mar 10		2470	6875	222 53	137 24	263 14	−21 7	411
		1	4732	320 10	103 0	228 50	+19 51	412
		2	4427	333 3	96 31	222 21	+18 59	412
		3	3333	6 28	85 16	211 6	+ 9 38	413
		4	3906	12 46	81 15	207 5	+11 26	413
		5	3751	15 32	81 8	206 58	+ 9 53	413
		6	1803	77 29	84 45	210 35	− 9 2	414
		7	2865	74 25	78 24	204 14	− 9 10	414
		8	8380	78 57	37 38	163 28	−14 30	415
		9	8866	85 49	32 4	157 54	−20 36	415
	11	2480	8347	225 21	152 26	266 37	−21 12	411
		1	5353	302 48	113 58	228 9	+19 42	412
		2	4801	312 54	107 21	221 32	+19 5	412
		3	0263	185 36	96 35	210 46	− 8 26	414
		4	2898	328 58	97 55	212 6	+ 9 31	413
		5	2847	348 56	92 11	206 22	+ 8 56	413
		6	3234	346 51	92 20	206 31	+11 19	413
		7	7978	86 51	43 7	157 18	−20 47	415
		8	7379	79 8	48 7	162 18	−14 24	415
	18	9	6676	290 6	133 20	147 46	+22 10	416
		2490	6419	299 28	127 5	141 31	+25 3	416
		1	6672	220 4	143 21	157 47	−21 38	415
		2	5625	223 42	136 6	150 32	−17 37	415
		3	0967	36 37	98 1	112 27	− 4 21	417
		4	2195	62 30	90 12	104 38	− 6 17	417
		5	3721	9 42	90 29	104 55	+10 54	418
		6	4087	11 40	88 29	102 55	+12 17	418
		7	4246	19 38	85 17	99 43	+10 51	418
		8	4305	83 1	78 3	92 27	−13 59	419
		9	5754	82 12	68 15	82 41	−15 34	419
		2500	6933	94 6	61 9	75 35	−24 57	420
	19	1	8102	222 47	157 41	158 4	−21 52	415
		2	7236	227 2	149 59	150 22	−17 38	415
		3	7813	280 19	147 1	147 24	+21 54	416
		4	7449	288 13	140 29	140 52	+25 10	416
		5	1792	257 56	113 55	114 18	− 4 32	417
		6	0110	282 12	104 23	104 46	− 6 35	417
		7	3054	333 2	104 27	104 50	+10 44	418
		8	3976	358 31	94 26	94 49	+14 24	418
		9	2391	98 9	92 2	92 25	−14 20	419
		2510	3973	87 39	81 40	82 3	−15 17	419
		1	5556	100 59	74 18	74 41	−25 9	420
	20	2	8988	273 34	163 2	147 3	+22 8	416
		3	8755	228 7	166 37	150 38	−17 49	415
		4	9261	224 3	173 38	157 39	−21 41	415
		5	4048	292 31	121 2	105 3	+10 44	418
		6	3918	313 38	113 22	97 23	+14 30	418
		7	3848	247 31	127 38	111 39	− 5 19	417
		8	3163	250 22	123 22	107 23	− 4 47	417
		9	1417	179 30	108 32	92 33	−14 16	419
		2520	1823	117 2	98 27	82 28	−15 8	419
		1	2772	116 15	94 34	78 35	−19 18	419
		2	3216	143 9	100 59	85 0	−25 11	420

1859	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Mar 20		2523	3883	119 53	90 55	74 56	−25 14	420
		4	9835	41 33	29 23	13 24	+21 10	421
22	80 457	5	7646	243 37	156 47	114. 50	− 5 6	417
		6	6635	244 40	148 27	106 30	− 5 1	417
		7	6829	268 54	146 1	104. 4	+11 4	418
		8	6285	277 5	139 48	97 51	+14. 0	418
		9	4617	225 43	133 36	91 39	−14. 39	419
		2530	3098	216 0	123 10	81 13	−15 3	419
		1	3568	177 57	115 54	73 57	−25 48	420
		2	8529	34 32	54 41	12 44	+21 2	421
		3	9029	35 16	48 25	6 28	+22 38	421
		4	9232	40 8	44 1	2 4	+19 19	421
31	89 515	5	9548	266 23	184 42	14 16	+19 19	421
		6	9074	266 18	177 3	6 37	+17 18	421
		7	8633	274 10	169 10	358 44	+22 5	421
		8	6283	262 41	152 28	342 2	+ 6 33	422
		9	5175	218 16	145 15	334 49	−18 28	423
		2540	4357	327 41	118 39	308 13	+19 7	425
		1	4005	82 12	93 0	282 34	−13 12	427
		2	5294	88 25	85 33	275 7	−18 18	427
		3	5933	84 54	80 32	270 6	−17 36	427
		4	8238	83 21	60 33	250 7	−19 45	429
Apr 1	90 476	5	9458	269 55	183 3	359 0	+22 12	421
		6	7720	255 55	165 53	341 50	+ 5 11	422
		7	7116	223 23	161 29	337 26	−18 52	423
		8	4924	303 6	132 7	308 4	+18 48	425
		9	3193	224 44	134 43	310 40	−12 2	424
		2550	2072	99 57	106 59	282 56	−13 19	427
		1	3599	99 47	99 4	275 1	−18 17	427
		2	4346	93 49	93 35	269 32	−18 26	427
		3	6948	85 35	73 47	249 44	−19 40	429
3	92 589	4	7563	274 50	161 45	307 43	+18 26	425
		5	7060	297 10	147 29	293 27	+28 59	426
		6	9602	227 3	193 35	339 33	−17 39	423
		7	3510	221 25	138 21	284 19	−13 32	427
		8	2683	199 27	130 27	276 25	−16 54	427
		9	2264	173 46	123 36	269 34	−18 29	427
7	96 476	2560	7104	213 29	165 24	256 14	−25 19	428
		1	5316	216 40	152 44	243 34	−19 8	429
		2	4659	212 11	147 35	238 25	−19 30	429
		3	7974	20 55	81 13	172 3	+28 11	430
		4	8507	21 8	75 53	166 43	+30 57	430
21	110 502	5	9631	269. 33	207 1	98 54	+22 35	431
		6	3030	174 15	142 49	34 42	−21 24	432
		7	2815	159 26	138 1	29 54	−21 9	432
		8	5644	93 21	104 56	356 49	−20 3	433
		9	7151	86 34	92 10	344 3	−19 12	433
		2570	7931	85 36	84 56	336 49	−19 46	433
		1	8036	44 3	86 1	337 54	+13 3	434
		2	8345	47 34	82 13	334 6	+11 4	434
May 5	124 483	3	9071	229 15	214 50	268 24	−17 12	435
		4	8957	225 44	212 57	266 31	−20 13	435
		5	8006	272 41	199 3	252 37	+18 14	436

1859	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
May 5		2576	6165	275 50	183 39	237 13	+14 29	436
		7	5709	282 50	178 37	232 11	+16 31	436
		8	4684	217 26	175 10	228 44	−16 24	437
		9	4827	182 3	163 45	217 19	−29 13	438
		2580	4537	168 33	156 15	209 49	−29 48	438
		1	3933	111 32	132 57	186 31	−19 30	439
		2	3613	97 29	131 29	185 3	−14 4	439
		3	4591	88 38	124 15	177 49	−13 8	439
		4	8238	81 19	95 1	148 35	−14 9	440
8	127 508	5	9413	265 19	221 8	231 48	+15 46	436
		6	9095	230 45	218 3	228 43	−16 20	437
		7	7824	216 55	201 10	211 50	−25 24	438
		8	7584	212 52	197 45	208 25	−27 37	438
		9	4055	219 2	174 29	185 9	−14 3	439
		2590	3189	103 39	137 41	148 21	−14 1	440
		1	6482	35 13	117 57	128 37	+17 22	441
		2	7127	35 32	113 6	123 46	+19 26	441
		3	6926	73 12	109 15	119 55	− 6 29	442
		4	7549	67 55	104 5	114 45	− 2 39	442
		5	9196	90 18	86 56	97 36	−22 26	444
		6	9783	89 14	74 50	85 30	−22 11	444
12	131 542	7	9654	234 42	231 41	185 8	−13 46	439
		8	6264	229 34	194 20	147 47	−13 46	440
		9	1833	226 7	166 38	120 5	− 6 44	442
		2600	0724	243 53	160 58	114 25	− 3 8	442
		1	5136	296 1	178 14	131 41	+19 38	441
		2	4343	308 33	169 57	123 24	+19 19	441
		3	5479	351 0	148 52	102 19	+29 21	443
		4	5873	357 44	143 41	97 8	+30 43	443
		5	4096	122 23	141 54	95 21	−22 3	444
		6	4314	111 57	137 33	91 0	−19 57	444
		7	5446	106 12	129 22	82 49	−22 1	444
		8	9800	52 24	79 46	33 13	+14 52	445
22	141 664	9	8436	270 23	221 54	31 46	+15 9	445
		2610	2451	159 19	166 3	335 55	−15 48	446
		1	3763	149 23	161 45	331 37	−23 12	446
		2	5281	32 19	141 2	310 54	+17 45	447
26	145 539	3	2777	328 29	174 9	289 3	+14 21	448
		4	2780	348 4	168 36	283 30	+14 46	448
		5	7784	59 17	120 13	235 7	+ 9 23	450
		6	8551	61 28	112 18	227 12	+ 8 41	450
		7	8499	57 24	113 22	228 16	+12 2	450
		8	9330	38 41	106 2	220 56	+30 38	453
		9	6048	116 22	141 24	256 18	−25 47	449
		2620	6832	113 52	134 58	249 52	−27 47	449
		1	8259	98 1	117 11	232 5	−21 35	451
		2	8688	96 45	112 4	226 58	−21 33	451
		3	9463	83 53	99 28	214 22	−11 13	452
June 5	155 652	4	9243	288 58	243 23	214 51	+29 58	453
		5	8383	299 3	227 59	199 27	+34 39	453
		6	4340	294 51	200 20	171 48	+15 39	456
		7	4108	303 48	196 38	168 6	+17 34	456
		8	3995	24 42	164 42	136 10	+18 7	457

1859	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
June 5		2629	5822	43° 56′	148° 46′	120° 14′	+18° 1′	458
		2630	8863	232 24	239 52	211 20	−20 54	454
		1	8421	226 29	233 12	204 40	−24 36	454
		2	5794	232 49	212 48	184 16	−13 15	455
		3	4720	224 14	204 9	175 37	−14 26	455
		4	8015	92 1	127 49	99 17	−12 37	459
9	159 563	5	9731	242 55	259 24	175 23	−14 18	455
		6	9210	276 24	249 21	165 20	+17 16	456
		7	6403	285 31	219 52	135 51	+17 39	457
		8	6196	287 12	217 58	133 57	+18 2	457
		9	2283	167 20	183 26	99 25	−12 42	459
		2640	2711	11 41	177 2	93 1	+14 43	460
		1	3282	21 15	172 42	88 41	+16 15	460
		2	5936	40 29	153 10	69 9	+21 22	461
		3	9761	39 32	109 21	25 20	+37 13	465
12	162 524	4	6601	238 44	225 33	99 32	−12 32	459
		5	9590	277 36	259 0	132 59	+18 3	457
		6	8417	275 39	242 28	116 27	+14 23	458
		7	5717	282 57	218 47	92 46	+14 3	460
		8	4467	153 46	178 58	52 57	−24 38	462
		9	8165	100 53	134 4	8 3	−17 12	468
		2650	7979	86 44	133 57	7 56	− 5 40	467
		1	7725	28 33	148 24	22 23	+37 3	465
		2	7888	62 54	135 27	9 26	+13 5	466
16	166 556	3	8445	229 11	242 47	59 35	−25 21	462
		4	7709	226 31	234 34	51 22	−24 40	462
		5	7727	301 57	232 56	49 44	+31 28	463
		6	4315	293 51	212 0	28 48	+14 46	464
		7	2089	334 3	193 39	10 27	+12 46	466
		8	9341	64 2	121 50	298 38	+15 59	471
		9	3086	173 15	190 58	7 46	−16 36	468
23	173 597	2660	9429	236 26	263 57	340 52	−24 51	469
		1	6726	221 11	229 53	306 48	−25 15	470
		2	4868	293 13	222 51	299 46	+15 39	471
		3	8829	110 42	138 39	215 34	−22 24	477
		4	8920	106 59	136 36	213 31	−19 29	477
		5	6953	94 22	153 36	230 31	− 5 46	476
		6	5904	66 40	161 48	238 43	+11 42	475
		7	6747	67 12	155 30	232 25	+12 39	475
		8	9184	51 39	133 1	209 56	+30 9	478
26	176 560	9	9734	237 42	273 20	308 14	−25 58	470
		2670	5478	206 47	218 7	253 1	−25 23	472
		1	1636	148 41	195 27	230 21	− 5 58	476
		2	3379	131 44	185 58	220 52	−11 48	476
		3	4865	140 49	182 35	217 29	−21 17	477
		4	5109	132 12	178 2	212 56	−19 38	477
		5	6303	123 31	167 50	202 44	−20 54	477
		6	8367	104 14	145 7	180 1	−14 27	479
		7	6013	35 7	173 23	208 17	+29 30	478
30	180 512	8	9020	288 51	266 47	245 41	+20 56	474
		9	8745	291 4	262 50	241 44	+22 22	474
		2680	9371	257 11	272 1	250 51	− 8 6	473
		1	7496	254 50	250 48	229 38	− 7 5	476

1859	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
June 30		2682	6476	224 42	234 43	213 33	−23 16	477
		3	5929	227 45	232 26	211 16	−19 25	477
		4	3078	170 47	201 26	180 16	−14 53	479
		5	4034	172 48	201 36	180 26	−20 46	479
		6	5623	318 14	226 53	205 43	+28 33	478
		7	7831	65 9	153 26	132 16	+18 42	481
July 3	183 525	8	9102	240 28	267 29	203 34	−23 36	477
		9	6645	241 45	244 1	180 6	−14 43	479
		2690	6040	234 23	237 42	173 47	−16 55	479
		1	8939	298 56	267 12	203 17	+28 36	478
		2	5068	290 39	234 59	171 4	+13 51	480
		3	4598	295 17	231 13	167 18	+14 53	480
		4	8394	64 54	150 42	86 47	+21 15	483
		5	8815	64 59	145 41	81 46	+21 58	483
		6	9926	59 8	122 47	58 52	+29 20	485
7	187 542	7	4881	140 42	191 2	70 9	−18 39	484
		8	6234	138 51	183 15	62 22	−24 37	484
		9	5221	131 54	186 7	65 14	−16 59	484
		2700	3304	4 52	208 22	87 29	+22 44	483
		1	3599	27 47	199 43	78 50	+22 3	483
		2	6637	48 18	175 42	54 49	+29 10	485
		3	8811	80 34	148 20	27 27	+10 7	486
		4	9450	75 7	139 8	18 15	+15 22	486
8	188 548	5	3912	168 40	206 8	70 59	−18 43	484
		6	3905	154 19	200 39	65 30	−16 45	484
		7	3843	331 43	222 37	87 28	+23 13	483
		8	3270	353 27	213 31	78 22	+22 33	483
		9	9293	102 54	144 3	8 54	− 9 58	487
		2710	5451	37 10	189 14	54 5	+29 18	485
		1	7574	80 19	161 59	26 50	+10 12	486
		2	8568	75 58	152 22	17 13	+14 25	486
		3	8513	73 49	153 10	18 1	+16 11	486
10	190 599	4	9069	243 42	273 28	109 13	−23 7	482
		5	8704	242 44	268 27	104 12	−22 33	482
		6	5446	201 45	225 5	60 50	−26 47	484
		7	4996	224 30	233 49	69 34	−17 42	484
		8	6697	303 3	251 19	87 4	+23 31	483
		9	5718	307 16	243 4	78 49	+22 50	483
		2720	7530	121 54	169 34	5 19	−19 29	487
		1	4412	353 55	216 48	52 33	+29 43	485
		2	3940	75 5	190 30	26 15	+10 0	486
		3	5399	66 53	182 20	18 5	+16 20	486
		4	7323	76 46	166 26	2 11	+13 25	488
		5	8372	73 1	156 47	352 32	+17 35	488
17	197 553	6	8758	250 51	276 54	14 1	−18 13	487
		7	7430	245 10	262 17	359 24	−18 2	487
		8	9323	284 37	288 35	25 42	+10 57	486
		9	7189	289 19	265 6	2 13	+13 41	488
		2730	6775	295 17	260 59	358 6	+17 14	488
		1	3263	171 56	215 21	312 28	−13 55	490
		2	3576	159 45	210 41	307 48	−14 19	490
		3	5561	148 2	198 41	295 48	−22 8	492
		4	2674	306 13	233 0	330 7	+12 28	489

1859	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	°	° ′	
July 17		2735	2917	84 47	202 49	299 56	+ 7 14	491
		6	4052	83 53	195 57	293 4	+ 8 31	491
		7	4193	77 6	195 36	292 43	+11 25	491
		8	9503	113 30	150 15	247 22	−16 18	494
		9	8672	107 54	161 3	258 10	− 9 5	494
		2740	9405	106 14	150 50	247 57	− 9 15	494
		1	5916	74 57	184 28	281 35	+15 13	493
		2	6844	75 31	177 23	274 30	+16 20	493
		3	6938	66 53	178 11	275 18	+22 15	493
		4	7540	66 25	173 6	270 13	+24 1	493
21	201 523	5	9405	287 42	293 49	334 38	+12 19	489
		6	6146	283 36	261 14	302 3	+ 8 19	491
		7	3238	332 28	234 25	275 14	+20 22	493
		8	2726	161 3	216 36	257 25	− 9 18	494
		9	4672	145 38	204 57	245 46	−15 58	494
		2750	3531	137 12	207 45	248 34	− 8 32	494
		1	6322	119 20	187 14	228 3	−10 15	495
		2	7290	115 34	179 8	219 57	−10 19	495
		3	8318	74 25	167 53	208 42	+20 55	496
		4	9152	70 6	157 42	198 31	+25 58	496
24	204 675	5	9885	286 25	308 7	304 12	+ 9 22	491
		6	8065	298 59	279 21	275 26	+20 8	493
		7	6247	255 9	262 2	258 7	− 9 37	494
		8	5047	249 43	253 4	249 9	− 9 1	494
		9	5055	233 28	248 22	244 27	−15 46	494
		2760	2747	212 35	233 3	229 8	− 9 12	495
		1	2773	177 9	223 25	219 30	−10 33	495
		2	8788	122 5	169 0	165 5	−18 27	498
		3	3574	47 48	212 11	208 16	+20 51	496
		4	4580	47 37	207 28	203 33	+25 25	496
		5	5307	55 21	200 43	196 48	+25 35	496
		6	4833	76 40	198 43	194 48	+14 35	497
		7	9220	69 48	159 41	155 46	+27 41	499
28	208 624	8	9709	262 12	303 53	243 58	−15 10	494
		9	9819	269 21	307 55	248 0	− 8 43	494
		2770	8781	267 56	290 7	230 12	− 7 17	495
		1	7977	265 2	281 14	221 19	− 7 56	495
		2	5032	182 59	226 38	166 43	−24 22	498
		3	3683	185 22	228 37	168 42	−15 57	498
		4	4547	169 6	220 33	160 38	−19 42	498
		5	5083	124 51	202 41	142 46	− 7 42	500
		6	6261	124 47	195 7	135 12	−11 2	500
		7	6228	308 3	266 3	206 8	+21 49	496
		8	5800	324 51	257 49	197 54	+29 14	496
		9	5262	322 51	255 13	195 18	+26 9	496
		2780	3174	330 54	242 12	182 17	+19 43	497
		1	2650	352 54	234 43	174 48	+20 9	497
		2	5316	85 29	198 27	138 32	+12 0	501
		3	9825	115 25	153 2	93 7	−14 34	502
31	211 515	4	9603	302 18	307 29	206 34	+22 27	496
		5	9031	311 32	296 27	195 32	+30 19	496
		6	8525	307 37	290 18	189 23	+25 57	496
		7	7667	301 58	282 9	181 14	+20 0	497

1859	Day	No	Dist	Pos	Fr Nodo	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
July 31		2788	7040	249 4	271 40	170 45	−17 5	498
		9	6512	245 59	266 52	165 57	−16 53	498
		2790	2122	336 23	240 0	139 5	+15 45	501
		1	3025	229 24	243 55	143 0	− 7 57	500
		2	7428	80 48	185 39	84 44	+16 26	503
		3	7987	79 4	180 36	79 41	+20 32	503
		4	7073	128 15	192 43	91 48	−14 47	502
Aug 4	215 486	5	8582	297 7	296 3	138 48	+15 55	501
		6	8122	298 59	290 57	133 42	+17 9	501
		7	4185	224 9	249 57	92 42	−14 51	502
		8	4061	214 58	246 8	88 53	−15 58	502
		9	2400	348 14	242 35	85 20	+18 35	503
		2800	2524	16 44	235 30	78 15	+20 30	503
		1	9513	85 13	163 58	6 43	+17 54	507
		2	8999	113 50	174 10	16 55	− 7 46	506
		3	9427	113 37	167 49	10 34	− 8 42	506
		4	9339	126 27	171 56	14 41	−20 7	505
11	222 735	5	5485	250 43	271 17	11 13	−12 10	506
		6	4717	244 24	265 8	5 4	−11 16	506
		7	7820	298 9	295 17	35 13	+14 24	504
		8	2950	322 36	257 44	357 40	+16 36	507
		9	3366	85 49	224 47	324 43	+12 22	508
		2810	4789	90 13	215 29	315 25	+12 35	508
		1	7133	98 27	198 1	297 57	+ 9 3	508
14	225 529	2	8716	268 40	304 22	4 40	−11 26	506
		3	8029	295 36	300 6	0 24	+11 45	507
		4	3312	303 44	265 7	325 25	+12 3	508
		5	2622	312 46	260 14	320 32	+13 11	508
		6	1691	325 2	254 5	314 23	+12 37	508
		7	1543	86 14	237 58	298 16	+ 9 27	508
		8	9141	137 45	187 13	247 31	−25 38	511
		9	9646	115 34	173 7	233 25	− 7 33	513
		2820	5597	92 17	212 37	272 55	+12 59	509
		1	9016	78 16	182 13	242 31	+27 36	512
18	229 511	2	8405	298 0	307 51	311 40	+12 45	508
		3	7896	298 20	302 41	306 30	+12 57	508
		4	3833	44 32	238 57	242 46	+26 26	512
		5	5135	56 55	228 12	232 1	+29 26	512
		6	6429	175 42	234 33	238 22	−30 8	511
		7	6842	153 51	219 28	223 17	−24 0	514
		8	7169	148 49	214 50	218 39	−22 55	514
		9	8117	146 16	205 56	209 45	−26 0	514
		2830	5335	150 40	226 42	230 31	−15 18	513
		1	4395	141 18	228 48	232 37	− 7 57	513
		2	6613	97 55	208 44	212 33	+11 9	515
		3	7203	96 2	204 2	207 51	+12 40	515
		4	8083	85 22	196 41	200 30	+21 31	516
21	232 533	5	6584	311 8	293 14	254 11	+20 10	510
		6	6210	317 31	289 7	250 4	+23 18	510
		7	5365	327 56	280 24	241 21	+26 9	512
		8	4929	343 51	271 53	232 50	+30 27	512
		9	6621	230 41	276 48	237 45	−27 32	511
		2840	4009	249 31	271 33	232 30	− 7 55	513

1859	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Aug 21		2841	5011	205 57	257 25	218 22	−22 48	514
		2	5214	189 41	248 24	209 21	−24 5	514
		3	0783	27 46	252 23	213 20	+11 16	515
		4	3388	60 42	239 2	199 59	+21 3	516
		5	9302	86 32	183 58	144 55	+22 33	519
		6	6591	159 13	226 12	187 9	−24 41	517
		7	6557	148 52	221 31	182 28	−19 27	517
		8	7913	139 10	207 26	168 23	−19 19	518
		9	8804	141 24	199 6	100 3	−24 56	518
25	236 521	2850	9474	278 6	326 42	231 6	− 8 14	513
		1	8958	260 21	314 36	219 0	−22 3	514
		2	7744	298 21	308 8	212 32	+11 24	515
		3	6227	315 7	293 54	198 18	+21 19	516
		4	6760	241 50	286 54	191 18	−23 46	517
		5	6419	233 48	280 42	185 6	−25 28	517
		6	6028	228 20	275 49	180 13	−25 5	517
		7	4548	212 9	263 10	167 34	−19 16	518
		8	5363	194 16	254 5	158 29	−25 10	518
		9	4499	175 43	246 14	150 38	−17 23	518
		2860	5882	159 37	233 31	137 55	−20 26	518
		1	4011	65 4	238 59	143 23	+22 51	519
		2	8576	80 25	198 49	103 13	+28 16	520
		3	9248	96 19	188 40	93 4	+14 39	520
		4	9712	88 53	179 27	83 51	+21 27	520
28	239 540	5	7890	258 18	305 11	166 44	−19 40	518
		6	7350	245 45	295 19	156 52	−25 10	518
		7	9639	310 16	335 51	197 24	+21 12	516
		8	4262	332 20	260 1	141 34	+23 12	519
		9	3602	337 11	275 18	136 51	+22 2	519
		2870	9831	118 39	181 51	43 24	− 6 56	522
		1	4746	60 10	239 54	101 27	+27 53	520
		2	4610	96 0	232 50	94 23	+12 45	520
		3	5188	87 3	230 3	91 36	+17 52	520
		4	6583	78 2	221 49	83 22	+26 3	520
		5	6542	88 3	220 6	81 39	+19 41	520
Sept 1	243 472	6	5079	307 31	293 55	99 42	+14 21	520
		7	5699	331 35	293 7	98 54	+27 50	520
		8	4223	320 55	286 30	92 17	+18 37	520
		9	3489	306 51	283 51	89 38	+12 4	520
		2880	3522	331 27	280 23	86 10	+19 56	520
		1	3774	352 43	275 22	81 9	+26 17	520
		2	2574	352 54	271 16	77 3	+20 6	520
		3	3159	189 59	260 16	66 3	−10 52	521
		4	4914	140 26	238 19	44 6	− 7 25	522
		5	6171	133 56	228 54	34 41	− 7 55	522
		6	7934	126 37	213 31	19 18	− 7 37	524
		7	8718	131 27	206 41	12 28	−13 44	524
		8	6646	87 18	223 23	29 10	+21 4	523
		9	9486	91 16	191 10	356 57	+21 8	525
11	253 437	2890	8802	254 5	324 53	349 19	−29 33	526
		1	8201	249 32	316 9	340 35	−29 26	526
		2	8222	255 26	319 16	343 42	−25 28	526
		3	9776	283 51	349 57	14 23	− 7 45	524

1859	Day	No	Dist	Pos	Fi Node	II Long	II Lat	Group
Sept 11		2894	4774	179° 53′	262° 0′	286° 26′	−18° 50′	529
		5	5238	170 34	256 8	280 34	−19 10	529
		6	5601	298 52	307 48	332 14	+ 8 57	527
		7	8335	312 56	330 11	354 37	+20 8	525
		8	1738	80 13	265 4	289 30	+12 31	528
		9	2686	95 53	258 30	282 56	+11 33	528
		2900	7421	110 24	225 29	249 55	+ 7 4	531
		1	8210	112 9	218 18	242 44	+ 5 10	531
		2	5617	92 47	240 19	264 45	+17 25	530
15	257 472	3	7620	260 45	319 49	287 1	−19 34	529
		4	6690	253 45	310 9	277 21	−19 42	529
		5	6719	304 16	319 55	287 7	+12 0	528
		6	1135	294 57	284 5	251 17	+ 7 9	531
		7	0126	108 13	276 49	244 1	+ 7 11	531
		8	3528	328 13	295 23	262 35	+18 6	530
		9	4392	109 20	251 24	218 36	+ 8 31	533
		2910	5099	106 39	246 48	214 0	+ 9 57	533
		1	7904	92 44	225 38	192 50	+21 15	535
18	260 437	2	9709	272 47	352 48	277 57	−19 13	529
		3	6337	262 20	313 48	238 57	−13 53	532
		4	7221	162 32	247 50	172 59	−26 23	536
		5	7252	298 29	327 9	252 18	+ 7 37	531
		6	8415	309 22	338 10	263 19	+16 8	530
		7	2294	298 43	293 45	218 54	+ 7 47	533
		8	0694	315 23	284 12	209 21	+ 8 26	533
		9	1608	11 14	282 41	207 50	+16 0	534
		2920	3420	65 29	266 36	191 45	+21 47	535
29	271 462	1	9057	318 31	356 36	125 22	+23 13	538
		2	8058	323 45	343 44	112 30	+26 12	538
		3	4785	330 26	316 22	85 8	+21 44	539
		4	9609	267 25	359 48	128 34	−25 0	537
		5	4948	260 24	315 25	84 11	−10 34	540
		6	5332	171 42	272 50	41 36	−19 43	542
		7	2731	159 12	279 53	48 39	− 4 12	541
		8	3498	155 45	275 43	44 29	− 6 27	541
		9	6350	146 30	257 18	26 4	−13 15	543
		2930	8096	143 44	242 45	11 31	−17 46	543
		1	7952	136 1	241 52	10 38	−11 30	543
		2	8755	132 25	232 47	1 33	−10 54	543
		3	9905	147 24	214 44	343 30	−29 45	547
Oct 6	278 560	4	9741	273 18	11 31	39 36	−20 41	542
		5	9776	275 28	12 58	41 3	−18 48	542
		6	9532	283 42	8 56	37 1	− 9 59	543
		7	8683	278 25	355 50	23 55	−12 7	543
		8	7421	274 30	342 51	10 56	−11 30	543
		9	7357	263 4	338 47	6 52	−18 58	544
		2940	6953	256 46	333 17	1 22	−21 4	544
		1	4187	249 35	315 20	343 25	−11 39	546
		2	6093	216 59	305 50	333 55	−30 22	547
		3	3303	308 47	317 24	345 29	+10 2	545
		4	1979	311 33	309 28	337 33	+ 9 10	545
		5	7712	149 46	255 7	283 12	−20 32	549
		6	8630	148 18	245 38	273 43	−23 24	549

1859	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Oct 6		2947	6020	75 0	267 27	295 32	+28 48	548
		8	9370	109 35	228 26	256 31	+ 8 32	550
9	281 531	9	9791	273 52	16 2	1 59	−20 30	544
		2950	8556	278 47	357 28	343 25	−11 36	546
		1	8601	305 11	1 0	346 57	+10 41	545
		2	8284	253 17	345 30	331 27	−30 5	547
		3	4698	194 33	295 25	281 22	−21 10	549
		4	5383	181 25	287 4	273 1	−23 9	549
		5	4229	2 10	312 40	298 37	+28 36	548
		6	5219	109 3	269 51	255 48	+ 9 3	550
		7	8799	89 55	240 14	226 11	+26 7	551
		8	8910	112 41	238 9	224 6	+ 6 5	553
		9	9347	111 23	231 53	217 50	+ 6 51	553
20	292 539	2960	9895	279 12	31 48	221 36	−15 44	552
		1	9717	300 51	28 46	218 34	+ 5 57	553
		2	9798	320 45	31 41	221 29	+25 15	551
		3	7049	253 0	346 34	176 22	−24 17	554
		4	5891	251 19	338 33	168 21	−19 38	554
		5	5575	185 20	299 38	129 26	−26 7	556
		6	7644	149 21	269 17	99 5	−20 54	558
		7	8349	146 45	261 47	91 35	−21 52	558
		8	2765	345 54	322 58	152 46	+17 22	555
		9	2918	0 21	319 59	149 47	+20 27	555
		2970	2153	355 46	318 42	148 30	+15 57	555
		1	1923	38 11	309 51	139 39	+16 6	555
		2	2394	60 26	304 11	133 59	+16 36	555
		3	3107	73 1	298 33	128 21	+17 21	555
		4	6418	77 18	277 51	107 39	+28 0	557
Nov 3	306 530	5	9953	314 7	51 31	42 52	+20 12	559
		6	5653	304 24	0 22	351 43	+ 9 2	561
		7	9570	281 30	37 56	29 17	−10 53	560
		8	9361	279 31	33 54	25 15	−12 12	560
		9	6921	260 16	3 37	354 58	−19 29	562
		2980	6238	253 32	356 26	347 47	−20 27	562
		1	5644	223 10	338 12	329 33	−28 13	563
		2	5610	215 38	333 31	324 52	−29 14	563
		3	6175	189 21	315 27	306 48	−32 34	564
		4	8040	141 5	277 13	268 34	−18 40	565
		5	8698	137 41	269 23	260 44	−18 5	565
		6	9934	130 58	244 34	235 55	−16 6	568
10	313 478	7	9821	259 15	47 56	300 44	−31 57	564
		8	7405	265 53	16 45	279 33	−17 7	565
		9	7405	264 3	16 13	279 1	−18 22	565
		2990	6786	255 15	8 27	261 15	−21 38	565
		1	6111	232 15	353 14	246 2	−28 56	566
		2	3952	246 13	349 21	242 9	−13 28	568
		3	3510	225 7	341 8	233 56	−15 38	568
		4	3275	260 58	349 24	242 12	− 6 46	567
		5	4668	161 20	314 24	207 12	−17 21	570
		6	5303	157 37	309 53	202 41	−18 55	570
		7	4267	46 21	322 14	215 2	+26 6	569
		8	7606	140 38	288 13	181 1	−18 31	571
		9	8429	138 48	279 49	172 37	−19 47	571

1859	Day	No	Dist	Pos	Ec Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Nov 10		3000	9726	87 5	256 50	149 38	+25 39	573
13	316 536	1	8971	257 19	33 39	243 4	−29 3	566
		2	9724	269 31	50 18	259 43	−20 59	565
		3	6540	274 17	32 48	242 23	−13 24	568
		4	8721	284 45	36 16	245 41	− 4 48	567
		5	7754	269 16	23 58	233 23	−15 24	568
		6	4640	237 16	352 41	202 6	−19 22	570
		7	3459	195 22	333 53	183 18	−17 6	571
		8	4453	169 39	321 43	171 8	−19 13	571
		9	5860	335 42	4 19	213 44	+26 23	569
		3010	6870	75 8	298 27	147 52	+26 31	573
		1	7829	78 49	288 55	138 20	+27 14	573
		2	7731	132 0	288 8	137 33	−13 24	574
		3	9379	143 49	271 31	120 56	−28 26	575
17	320 459	4	9243	266 19	44 36	198 22	−21 29	570
		5	8034	265 49	30 1	183 47	−18 15	571
		6	7487	261 46	23 58	177 44	−19 31	571
		7	4539	355 36	352 37	146 23	+26 31	573
		8	5731	175 37	324 3	117 49	−28 45	575
		9	7075	143 38	300 53	94 39	−20 34	578
		3020	6932	130 29	298 32	92 18	−11 36	579
		1	8049	127 21	288 22	82 8	−11 41	579
		2	6190	91 58	303 18	97 4	+13 28	577
20	323 506	3	8730	259 3	39 4	149 37	−25 24	572
		4	8339	321 1	36 6	146 39	+26 42	573
		5	6019	234 0	5 34	116 7	−27 52	575
		6	2132	5 55	346 16	96 49	+13 58	577
		7	2363	199 29	343 7	93 40	−11 31	579
		8	3190	161 24	331 33	82 6	−12 21	579
		9	7681	138 50	297 37	48 10	−20 17	580
		3030	8970	121 59	280 33	31 6	− 9 50	583
		1	9371	124 42	275 1	25 34	−13 3	583
		2	7073	85 33	300 37	51 10	+18 27	581
		3	7986	81 22	293 25	43 58	+23 43	581
		4	7932	93 45	291 42	42 15	+14 1	582
24	327 541	5	9707	259 10	60 19	113 38	−27 59	575
		6	8097	272 37	39 46	93 5	−11 52	579
		7	9694	300 44	62 48	116 7	+12 9	576
		8	4553	242 32	6 33	59 52	−17 33	580
		9	3676	342 35	0 25	53 44	+18 46	581
		3040	3630	11 12	350 10	43 29	+22 35	581
		1	2219	12 13	348 44	42 3	+14 16	582
		2	2718	158 52	337 9	30 28	−10 27	583
		3	3434	153 58	333 2	26 21	−12 33	583
		4	6378	150 7	316 1	9 20	−23 34	584
		5	7351	143 2	306 8	359 27	−23 17	584
27	330 478	6	7258	316 37	33 3	44 43	+21 28	581
		7	6728	322 11	27 11	38 51	+23 22	581
		8	6672	308 3	30 15	41 55	+14 24	582
		9	5025	263 20	17 55	29 35	−10 46	583
		3050	4720	257 52	14 56	26 36	−12 21	583
		1	4514	214 31	358 30	10 10	−24 15	584
		2	2746	73 43	336 55	348 35	+ 9 57	585

1859	Day	No	Dist.	Pos	Fl Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Nov 27		3053	3358	78 7	333 0	344 40	+10 37	585
		4	4361	63 17	331 3	342 43	+18 48	585
Dec 11	344 520	5	9834	260 42	83 5	255 34	−20 54	586
		6	9166	268 30	70 4	242 33	−12 27	587
		7	8136	260 13	56 44	229 13	−17 46	587
		8	4082	200 50	8 21	180 50	−24 13	590
		9	6044	317 33	35 46	208 15	+20 5	588
		3060	5500	326 43	29 11	201 40	+22 13	588
		1	3951	342 38	16 9	188 38	+19 32	589
		2	3658	3 17	7 42	180 11	+20 33	589
		3	6746	61 26	329 53	142 22	+25 24	592
		4	9929	114 7	281 31	94 0	−12 12	595
15	348 549	5	9160	256 28	73 1	188 21	−21 56	590
		6	8621	252 2	64 56	180 16	−24 27	590
		7	9182	302 24	72 50	188 10	+19 55	589
		8	7884	315 17	54 10	169 30	+26 13	591
		9	7171	323 39	44 36	159 56	+28 39	591
		3070	5806	330 53	32 22	147 42	+25 40	592
		1	5209	336 52	26 40	142 0	+24 43	592
		2	6762	147 28	336 25	91 45	−30 37	596
		3	5188	121 22	338 59	94 19	−11 44	595
		4	8240	119 18	314 29	69 49	−16 19	597
		5	9808	77 46	291 17	46 37	+21 36	598
18	351 519	6	8771	307 39	68 36	141 48	+24 17	592
		7	8319	301 39	64 54	138 6	+18 1	593
		8	6577	297 46	50 36	123 48	+11 15	594
		9	5729	301 8	44 0	117 12	+11 22	594
		3080	2264	230 13	20 12	93 24	−11 8	595
		1	3652	142 26	355 35	68 47	−15 56	597
		2	7159	65 13	331 29	44 41	+22 6	598
		3	8585	113 5	313 4	26 16	−13 1	599
22	355 486	4	8708	265 43	75 36	92 32	−10 36	595
		5	6164	253 54	51 23	68 19	−15 24	597
		6	4444	343 12	26 30	43 26	+22 2	598
		7	2304	160 9	9 22	26 18	−13 44	599
		8	5612	111 41	342 12	359 8	− 9 50	600
		9	6816	106 41	332 56	349 52	− 8 5	600
		3090	9304	116 29	307 50	324 46	−18 56	601
27	360 535	1	9712	297 55	94 18	39 37	+22 5	598
		2	8298	266 10	76 26	21 45	− 8 14	599
		3	7400	264 18	67 56	13 15	− 9 9	599
		4	5656	260 35	54 18	359 37	− 9 51	600
		5	4198	260 10	44 44	350 3	− 8 13	600
		6	2961	170 10	16 10	321 29	−19 7	601
		7	9426	115 19	310 44	256 3	−20 31	603
		8	4920	54 10	357 40	302 59	+16 8	602
		9	5782	72 29	347 41	293 0	+10 18	602
Jan 2 1860	1 521	3100	9538	252 55	99 0	319 25	−18 40	601
		1	3285	204 58	34 43	255 8	−22 3	603
		2	3361	176 44	24 55	245 20	−22 42	604
		3	2611	139 22	16 16	236 41	−14 17	605
		4	3795	171 6	22 19	242 44	−25 2	604
		5	4563	160 42	16 5	236 30	−28 19	604

1860	Day	No	Dist	Pos	Ir Node	II Long	II Lat	Group
				° ′	° ′	° ′	° ′	
Jan 2		3106	4517	106 43	0 31	220 56	− 9 41	607
		7	5093	104 13	356 33	216 58	− 9 12	607
		8	6924	126 2	347 35	208 0	−25 33	609
		9	7507	122 14	341 32	201 57	−24 47	609
		3110	4097	32 11	14 2	234 27	+17 23	606
		1	4504	42 29	8 45	229 10	+16 43	606
		2	7521	57 40	344 20	204 45	+22 18	608
		3	9558	117 7	314 19	174 44	−25 24	610
7	6465	4	8722	244 0	91 0	241 17	−23 37	604
		5	8329	237 3	84 52	235 9	−28 27	604
		6	6500	259 5	71 56	222 13	− 9 21	607
		7	5589	260 6	65 24	215 41	− 8 8	607
		8	8111	299 9	80 26	230 43	+21 26	606
		9	8053	303 5	78 30	228 47	+24 8	606
		3120	5819	302 50	61 40	211 57	+15 31	608
		1	5182	306 21	56 48	207 5	+14 48	608
		2	5550	321 19	53 9	203 26	+22 24	608
		3	6239	123 30	357 36	147 53	−23 43	611
		4	6888	122 3	352 15	142 32	−24 52	611
		5	8058	71 31	340 20	130 37	+11 42	612
		6	9155	76 6	326 52	117 9	+10 16	612
11	10462	7	6044	235 46	69 20	163 55	−21 48	610
		8	5778	227 37	65 5	158 40	−25 10	610
		9	4371	215 20	52 51	146 26	−24 1	611
		3130	3987	205 94	47 42	141 17	−24 33	611
		1	2675	351 28	37 16	130 51	+11 10	612
		2	3040	13 1	30 51	124 26	+12 45	612
		3	3230	26 44	26 23	119 58	+12 6	612
		4	3375	37 52	22 50	116 25	+10 40	612
		5	8122	118 55	344 31	78 6	−27 54	614
		6	6125	100 9	358 24	91 59	−11 14	613
16	15478	7	8309	281 15	94 50	117 16	+10 51	612
		8	4924	249 28	69 41	92 7	−11 34	613
		9	3519	249 23	60 52	83 16	− 9 45	613
		3140	6662	100 59	359 42	22 8	−14 14	616
		1	6258	91 35	2 8	24 34	− 7 54	616
		2	9087	109 33	336 6	358 32	−24 24	619
		3	8918	73 21	339 6	1 32	+ 7 58	618
17	16480	4	9369	278 9	109 36	117 49	+11 9	612
		5	6764	252 28	84 9	92 22	−11 31	613
		6	5597	253 30	75 37	83 50	−10 0	613
		7	4304	92 31	16 29	24 42	− 7 51	616
		8	4930	103 55	13 34	21 47	−12 26	616
		9	8008	111 25	350 32	358 45	−24 23	619
		3150	7552	70 6	354 27	2 40	+ 7 25	618
		1	8325	72 3	346 56	355 9	+ 7 25	618
		2	7588	53 40	358 16	6 29	+19 15	617
		3	7846	55 33	355 24	3 37	+18 51	617
		4	8181	54 22	352 38	0 51	+20 58	617
19	18554	5	6157	254 9	81 50	60 39	− 9 35	615
		6	0836	207 59	46 41	25 30	− 8 54	616
		7	5209	125 2	18 42	357 31	−24 43	619
		8	4105	52 15	23 16	2 5	+ 7 32	618

1860	Day	No	Dist	Pos	Fr Node	H Long	H. Lat	Group
				° ′	° ′	° ′	° ′	
Jan 19		3159	4616	28 0	28 3	6 52	+17 26	617
		3160	5871	36 35	18 35	357 24	+20 44	617
		1	5171	60 18	15 25	354 14	+ 7 16	618
		2	8923	91 12	340 37	319 26	− 9 14	622
22	21 456	3	3864	199 57	58 22	356 1	−25 1	619
		4	3569	299 6	63 31	1 10	+ 7 21	618
		5	5489	307 26	70 44	8 23	+18 8	617
		6	4960	310 0	67 6	4 45	+16 37	617
		7	5919	352 11	46 48	344 27	+30 53	620
		8	4264	90 46	21 48	319 27	− 8 27	622
23	22 500	9	5142	218 55	72 34	355 24	−25 10	619
		3170	3483	182 46	52 14	335 4	−25 12	621
		1	5408	284 26	78 0	0 50	+ 7 28	618
		2	6943	294 26	85 36	8 26	+17 52	617
		3	6429	304 32	78 10	1 0	+21 18	617
		4	5805	310 26	72 0	354 50	+20 58	617
		5	6241	332 13	61 50	344 40	+30 45	620
		6	1927	97 8	37 12	320 2	− 8 12	622
		7	3275	90 2	28 58	311 48	− 7 48	622
		8	9937	104 58	322 57	245 47	−23 48	627
		9	9977	99 54	320 31	243 21	−18 36	627
		3180	8664	55 48	352 30	275 20	+19 7	626
		1	9114	56 54	346 29	269 19	+19 51	626
24	23 469	2	6544	227 58	86 5	355 10	−25 16	619
		3	7084	277 45	92 0	1 5	+ 7 42	618
		4	8256	287 29	99 52	8 57	+18 4	617
		5	7421	295 9	89 48	358 53	+20 23	617
		6	7047	297 52	85 54	354 49	+20 33	617
		7	3808	157 25	43 10	312 15	−27 0	623
		8	3955	149 20	39 31	308 36	−26 47	623
		9	0634	222 55	51 49	320 54	− 7 39	622
		3190	1067	102 52	43 14	312 19	− 7 39	622
		1	9370	104 42	339 12	248 17	−23 56	627
		2	9465	99 33	337 18	246 23	−19 9	627
		3	7382	49 6	7 41	276 46	+18 57	626
		4	8188	51 50	359 39	268 44	+20 5	626
28	27 527	5	7884	229 27	102 53	314 25	−26 53	623
		6	8298	253 49	109 19	320 51	− 7 49	622
		7	6022	285 46	86 14	297 46	+10 41	625
		8	4279	128 45	35 21	246 53	−24 21	627
		9	4101	117 0	32 58	244 30	−19 50	627
		3200	5641	117 44	23 53	235 25	−25 27	627
		1	6971	65 22	10 28	222 0	+ 5 29	629
		2	7861	66 31	2 49	214 21	+ 6 24	629
		3	8015	56 48	3 31	215 3	+14 12	630
		4	8744	57 4	355 51	207 23	+16 18	630
		5	8984	54 26	353 35	205 7	+19 23	630
30	29 594	6	9412	241 36	126 2	308 14	−17 52	624
		7	7385	284 42	98 15	280 27	+14 42	626
		8	3396	192 38	63 53	246 5	−23 48	627
		9	2709	191 26	61 37	243 49	−20 14	627
		3210	3403	159 38	51 52	234 4	−25 26	627
		1	3563	0 55	50 40	232 52	+14 24	628

1860	Day	No	Dist	Pos	Fr Node	II Long	II Lat	Group
				° ′	° ′	° ′	° ′	
Jan 30		3212	3528	46 21	37 49	220 1	+ 5 9	629
		3	4412	52 8	31 53	214 5	+ 5 51	629
		4	5300	36 32	31 11	213 23	+15 18	630
		5	6151	43 56	23 38	205 50	+15 21	630
		6	6754	38 21	21 47	203 59	+20 50	630
		7	7915	50 18	8 13	190 25	+17 56	632
Feb 1	31 501	8	5961	224 33	90 7	245 17	−24 3	627
		9	5552	229 28	88 26	243 36	−20 21	627
		3220	4652	211 34	77 53	233 3	−25 10	627
		1	5127	301 6	79 43	234 53	+14 59	628
		2	4630	308 26	74 44	229 54	+15 10	628
		3	2483	308 44	66 7	221 17	+ 5 8	629
		4	2051	340 23	58 38	213 48	+ 5 39	629
		5	2247	119 8	47 9	202 19	−14 27	631
		6	3690	344 37	58 19	213 29	+15 30	630
		7	3897	2 53	51 4	206 14	+16 0	630
		8	4859	5 0	48 14	203 24	+21 34	630
		9	4063	69 25	33 31	188 41	− 2 11	634
		3230	5303	27 50	36 8	191 18	+18 13	632
2	32 501	1	7414	230 6	104 11	245 10	−24 3	627
		2	7098	234 16	102 11	243 10	−20 31	627
		3	6060	223 35	91 42	232 41	−24 43	627
		4	6619	288 32	93 53	234 52	+15 4	628
		5	6114	291 31	89 33	230 32	+14 51	628
		6	4284	283 34	80 44	221 43	+ 5 15	629
		7	3308	297 4	72 54	213 53	+ 6 16	629
		8	1587	193 35	62 17	203 16	−14 13	631
		9	1562	158 19	56 42	197 41	−14 56	631
		3240	4421	313 59	72 42	213 41	+15 41	630
		1	4748	339 33	62 5	203 4	+21 51	630
		2	4328	3 49	50 44	191 43	+18 22	632
		3	5360	25 11	37 50	178 49	+19 13	635
		4	9795	89 23	339 0	119 59	−13 2	640
6	36 488	5	8521	241 53	120 56	205 21	−15 6	631
		6	7904	240 31	114 27	198 52	−15 53	631
		7	6683	241 6	103 55	188 20	−14 27	633
		8	6140	240 51	99 46	184 11	−14 6	633
		9	9469	263 10	132 24	216 49	+ 4 54	629
		3250	9375	274 44	128 46	213 11	+15 18	630
		1	8746	284 26	117 25	201 50	+21 15	630
		2	5022	309 28	80 18	164 43	+17 46	636
		3	5221	318 11	77 10	161 35	+21 20	636
		4	4029	21 17	48 21	132 46	+12 53	638
		5	4371	26 36	45 12	129 37	+13 10	638
		6	4096	93 24	38 42	123 7	−12 56	640
		7	5382	89 40	29 57	114 22	−12 48	640
		8	6621	91 37	21 5	105 30	−15 13	640
		9	6815	49 47	23 30	107 55	+12 23	641
		3260	7752	53 7	15 7	99 32	+13 1	641
		1	8553	57 20	6 18	90 43	+12 8	641
9	39 572	2	6672	223 33	104 21	145 2	−25 10	637
		3	9084	279 32	125 57	166 38	+19 24	636
		4	2990	226 2	81 0	121 41	−14 28	640

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Feb 9		3265	1498	213 8	71 54	112 35	−12 8	640
		6	1594	161 31	64 50	105 31	−15 38	640
		7	3570	333 48	69 16	109 57	+13 56	641
		8	3528	1 15	59 24	100 5	+13 11	641
		9	3926	20 36	51 44	92 25	+12 6	641
		3270	5012	29 49	43 51	84 32	+14 31	641
		1	7187	106 5	22 9	62 50	−26 49	643
		2	8131	77 56	10 47	50 28	− 6 32	644
12	42 545	3	8167	244 11	123 27	121 58	−11 27	640
		4	7732	240 30	119 10	117 41	−14 15	640
		5	6835	242 25	111 33	110 4	−12 25	640
		6	6374	238 35	107 43	106 14	−14 36	640
		7	8851	282 20	124 42	123 13	+21 37	639
		8	7413	279 58	111 26	109 57	+14 25	641
		9	6265	283 36	101 58	100 29	+12 44	641
		3280	5061	301 15	88 58	87 29	+15 41	641
		1	6908	44 24	29 59	28 30	+14 23	646
		2	7862	45 37	21 56	20 27	+16 58	646
13	43 460	3	9271	240 52	137 57	123 29	−13 54	640
		4	8716	241 2	130 24	115 56	−13 51	640
		5	7720	238 51	119 55	105 27	−15 17	640
		6	9328	278 29	133 24	118 56	+20 40	641
		7	8493	274 39	123 43	109 15	+14 14	641
		8	7715	276 23	115 50	101 22	+13 5	641
		9	6345	288 35	101 41	87 13	+15 51	641
		3290	5659	288 21	97 31	83 3	+13 4	641
		1	7080	8 27	48 8	33 40	+33 26	645
		2	7536	11 54	43 3	28 35	+35 15	645
		3	5402	33 11	44 8	29 40	+14 11	646
		4	6685	38 54	34 14	19 46	+16 35	646
		5	8754	82 1	7 45	353 17	−10 58	647
15	45 540	6	9633	238 13	146 48	102 50	−15 31	640
		7	8684	271 21	128 34	84 36	+12 41	641
		8	6385	284 15	105 16	61 18	+13 58	642
		9	3571	334 33	74 18	30 20	+13 50	646
		3300	4172	0 24	63 44	19 46	+16 33	646
		1	6407	334 8	77 42	33 44	+32 25	645
		2	6837	344 28	69 42	25 44	+36 7	645
		3	4909	80 4	41 58	358 0	− 9 38	647
		4	5634	82 59	37 8	353 10	−11 31	647
17	47 525	5	9030	270 56	134 44	62 36	+13 58	642
		6	5854	286 54	102 49	30 41	+13 38	646
		7	5339	289 36	98 57	26 49	+12 50	646
		8	5063	304 25	92 7	19 59	+17 7	646
		9	7645	305 12	105 50	33 42	+32 0	645
		3310	7597	314 37	98 49	26 41	+36 12	645
		1	0579	134 30	71 53	359 45	− 9 48	647
		2	1523	103 25	65 51	353 43	−11 22	647
20	50 432	3	9216	267 1	140 56	27 34	+11 54	646
		4	8776	274 30	133 20	19 58	+16 50	646
		5	4076	230 28	99 30	346 8	−14 34	647
		6	3397	221 16	94 12	340 50	−16 16	647
		7	9709	286 28	144 53	31 31	+32 2	645

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	°	° ′	° ′	
Feb 20		3318	9452	289 52	137 45	24 23	+33 18	645
		9	9450	293 25	136 4	22 42	+36 22	645
		3320	9376	295 51	133 24	20 2	+37 53	645
		1	9858	94 13	354 11	240 49	−24 5	650
		2	9700	86 47	359 16	245 54	−17 4	649
22	52 584	3	7826	237 35	130 19	346 25	−14 15	647
		4	4661	333 5	82 6	298 12	+20 25	648
		5	4805	349 37	73 46	289 52	+21 10	648
		6	7458	87 39	30 27	246 33	−17 36	649
		7	8164	94 48	24 23	240 29	−24 1	650
23	53 541	8	5311	308 42	96 31	299 3	+20 9	648
		9	4869	325 36	86 55	289 27	+21 2	648
		3330	5890	90 18	44 16	246 48	−17 34	649
		1	6893	97 34	37 46	240 18	−23 54	650
24	54 490	2	6412	293 18	109 59	299 4	+20 2	648
		3	5573	306 5	99 41	288 46	+20 53	648
		4	3850	96 53	59 38	248 43	−16 43	649
		5	4229	97 12	57 24	246 29	−17 44	649
		6	5539	103 39	50 24	239 29	−24 7	650
		7	9819	81 52	0 22	189 27	−13 15	651
		8	9763	80 26	2 6	191 11	−11 58	651
27	57 500	9	9859	265 8	161 18	307 42	+14 37	648
		3340	9623	272 27	153 27	299 51	+20 19	648
		1	9226	277 35	144 51	291 15	+23 0	648
		2	3781	224 4	104 20	250 44	−15 45	649
		3	3338	213 53	100 9	246 33	−17 49	649
		4	3270	183 20	92 2	238 26	−24 17	650
		5	6052	79 11	46 13	192 37	−11 54	651
		6	6518	81 36	42 51	189 15	−13 40	651
		7	8672	72 36	23 9	169 33	− 6 47	653
		8	7995	37 37	37 11	183 35	+19 36	652
		9	9094	44 40	22 43	169 7	+18 29	654
		3350	9205	47 42	20 20	166 44	+16 16	654
		1	9586	43 59	14 43	161 7	+21 20	654
29	59 495	2	6790	229 1	127 46	245 51	−18 17	649
		3	5968	215 13	118 50	236 55	−24 59	650
		4	1890	90 43	75 18	193 23	−11 8	651
		5	2736	91 49	70 38	188 43	−13 8	651
		6	5265	15 45	65 57	184 2	+17 54	652
		7	6172	19 40	59 43	177 48	+21 7	652
		8	5652	70 14	50 58	169 3	− 6 57	653
		9	6908	31 19	50 2	168 7	+18 44	654
		3360	6495	34 4	51 48	169 53	+15 29	654
		1	7871	33 43	41 35	159 40	+21 27	654
Mar 1	60 576	2	8341	231 14	143 28	246 13	−17 57	649
		3	7556	221 43	134 29	237 14	−24 27	650
		4	1119	208 34	91 40	194 25	−11 12	651
		5	1000	158 40	86 42	189 27	−12 52	651
		6	3374	68 25	66 52	169 37	− 6 51	653
		7	4387	346 50	82 37	185 22	+18 27	652
		8	5574	1 54	72 28	175 13	+23 36	652
		9	4188	24 32	68 46	171 31	+ 9 54	654
		3370	4953	17 31	67 39	170 24	+15 39	654

1860	Day	No	Dist.	Pos.	Fr Node	H Long	H. Lat	Group
Mar 1		3371	5563	16° 31′	65° 16′	168° 1′	+19° 5′	654
		2	6606	22 35	56 50	159 35	+21 50	654
		3	9422	78 47	15 26	118 11	−12 27	656
		4	9780	82 56	7 27	110 12	−15 58	656
		5	9383	41 43	22 4	124 49	+21 40	655
2	61 636	6	9355	230 46	157 57	245 40	−18 27	649
		7	8818	223 42	149 43	237 26	−24 35	650
		8	3226	233 42	106 14	193 57	−11 17	651
		9	2537	224 10	101 26	189 9	−12 47	651
		3380	4709	321 50	95 36	183 19	+19 42	652
		1	4767	334 21	89 29	177 12	+21 8	652
		2	1103	67 29	81 22	169 5	− 7 5	653
		3	2967	349 29	84 14	171 57	+ 9 40	654
		4	4051	352 54	81 27	169 10	+15 48	654
		5	4619	355 36	79 11	166 54	+18 54	654
		6	5512	6 28	71 13	158 56	+21 57	654
		7	6659	73 52	45 44	133 27	− 9 21	656
		8	9165	81 56	20 31	108 14	−15 46	656
		9	8699	87 46	26 55	114 38	−20 50	656
		3390	8489	77 44	29 8	116 51	−12 11	656
		1	8516	37 10	36 2	123 45	+21 21	655
5	64 440	2	7645	235 37	140 42	188 39	−13 26	651
		3	5119	246 32	121 24	169 21	− 6 29	653
		4	7823	279 57	134 47	182 44	+19 56	652
		5	6339	287 5	121 8	169 5	+17 47	654
		6	6197	290 38	118 49	166 46	+18 51	654
		7	5118	84 40	60 19	108 16	−15 2	656
		8	5311	3 38	75 53	123 50	+21 21	655
		9	6089	8 31	70 15	118 12	+24 31	655
		3400	9159	70 0	24 1	71 58	− 5 28	659
		1	9163	43 17	28 42	76 39	+18 29	658
6	65 459	2	8912	233 39	155 15	188 44	−15 5	651
		3	9029	237 38	156 42	190 11	−11 29	651
		4	6997	245 15	136 6	169 35	− 6 19	653
		5	8866	274 10	148 27	181 56	+20 5	652
		6	7707	277 16	135 43	169 12	+17 45	654
		7	7508	280 21	132 57	166 26	+19 2	654
		8	1499	163 36	92 36	126 5	−15 41	656
		9	2940	118 53	80 28	112 57	−20 21	656
		3410	3073	93 18	75 6	108 35	−14 41	656
		1	5509	349 36	83 56	117 25	+25 17	655
		2	7945	68 6	38 52	72 21	− 5 16	659
		3	8152	37 35	43 6	76 35	+18 50	658
		4	9730	40 3	19 58	53 27	+24 1	661
8	67 624	5	9504	242 2	165 57	168 44	− 6 28	653
		6	9601	267 26	163 50	166 37	+17 43	654
		7	9467	268 44	160 55	163 42	+18 18	654
		8	2494	213 45	106 13	109 0	−14 42	656
		9	6464	295 12	121 10	123 57	+22 38	655
		3420	5661	306 10	111 41	114 28	+22 20	655
		1	3996	117 45	77 48	80 35	−24 58	657
		2	6819	95 30	52 52	55 39	−24 43	660
		3	4711	60 27	65 53	68 40	− 3 29	659

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Mar 8		3424	5411	13 5	73 54	76 41	+18 57	658
		5	7983	29 22	49 54	52 41	+23 41	661
		6	8631	30 2	43 8	45 55	+26 24	661
		7	9463	50 29	25 14	28 1	+12 36	663
		8	9673	76 39	17 37	20 24	−11 35	664
10	69 519	9	7456	226 48	143 34	119 28	−19 6	656
		3430	6129	231 21	133 15	109 9	−14 40	656
		1	5004	230 13	125 15	101 9	−14 5	656
		2	8836	272 4	152 36	128 30	+18 54	655
		3	8417	279 11	145 24	121 18	+22 46	655
		4	4132	221 34	118 36	94 30	−16 26	656
		5	3768	215 4	115 23	91 17	−17 54	656
		6	3352	182 47	105 6	81 0	−24 24	657
		7	3371	171 57	101 29	77 23	−25 56	657
		8	4501	324 38	101 4	76 58	+18 57	658
		9	3924	122 30	81 43	57 37	−25 55	660
		3440	5955	6 47	76 20	52 14	+23 59	661
		1	6645	10 35	70 52	46 46	+26 40	661
		2	7611	74 24	45 46	21 40	−10 54	664
		3	8305	75 36	39 4	14 58	−11 48	664
		4	7373	41 42	52 23	28 17	+12 34	663
		5	7727	44 45	48 36	24 30	+11 31	663
		6	8444	37 25	44 2	19 56	+19 33	663
13	72 446	7	9631	232 26	173 58	108 21	−14 34	656
		8	8917	231 18	162 18	96 41	−15 57	656
		9	8525	228 21	157 26	90 49	−18 24	656
		3450	7663	277 6	141 58	76 21	+18 26	658
		1	7177	283 29	135 40	70 3	+20 27	658
		2	5904	307 20	116 25	50 48	+24 28	661
		3	2296	85 15	85 55	20 18	−11 19	664
		4	3446	83 1	78 59	13 22	−12 34	664
		5	3360	349 39	93 50	28 13	+11 52	663
		6	3568	2 40	89 7	23 30	+11 28	663
		7	4963	1 16	85 28	19 51	+19 34	663
		8	9664	90 47	22 3	316 26	−26 4	669
		9	9498	87 20	25 42	320 5	−22 47	669
		3460	7944	26 33	55 56	350 19	+24 51	667
		1	8423	28 53	50 19	344 42	+25 35	667
15	74 490	2	8855	246 19	162 48	68 11	− 2 24	659
		3	7944	235 33	153 36	58 59	−12 0	659
		4	9606	267 2	170 40	76 3	+18 32	658
		5	9224	269 12	163 25	68 48	+18 49	658
		6	4836	288 24	121 46	27 9	+12 39	663
		7	2560	230 4	115 8	20 31	−10 40	664
		8	1576	211 3	108 15	13 38	−12 3	664
		9	5914	359 32	85 4	350 27	+25 43	667
		3470	6728	5 29	77 59	343 22	+28 58	667
		1	5065	20 54	78 49	344 12	+14 9	666
		2	9558	40 43	32 18	297 41	+20 57	670
18	77 593	3	9219	227 1	171 43	33 5	−19 6	662
		4	8664	224 33	164 2	25 24	−21 1	662
		5	8197	236 20	159 11	20 33	−10 57	664
		6	5208	218 59	133 21	354 43	−19 10	665

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
Mar 18		3477	5589	282 2	130 53	352 15	+13 29	666
		8	2968	140 33	99 10	320 32	−23 35	669
		9	3545	128 41	93 50	315 12	−25 20	669
		3480	6375	19 50	75 4	296 26	+20 38	670
22	81 585	1	7987	240 6	160 59	325 44	− 7 31	668
		2	7420	236 5	155 53	320 38	−10 43	668
		3	5687	295 55	129 46	294 31	+20 2	670
		4	4778	38 37	82 13	246 58	+ 5 47	671
		5	6375	33 3	73 47	238 32	+13 39	673
		6	7150	35 20	67 33	232 18	+15 4	673
		7	8056	33 52	60 29	225 14	+19 31	673
		8	8937	76 1	43 50	208 35	−13 26	674
24	83 567	9	8679	273 51	163 41	300 19	+21 31	670
		3490	8117	274 59	157 27	294 5	+20 2	670
		1	3380	148 17	107 30	244 8	−26 18	672
		2	2196	323 36	112 1	248 39	+ 5 40	671
		3	2118	340 4	108 28	245 6	+ 5 22	671
		4	3741	356 23	101 24	238 2	+13 30	673
		5	6220	77 24	71 22	208 0	−13 29	674
		6	7999	85 1	56 54	193 32	−20 39	674
		7	9570	68 51	36 16	172 54	− 6 25	677
		8	9044	41 23	49 6	185 44	+17 16	675
25	84 467	9	9022	270 22	169 57	293 49	+20 11	670
		3500	3949	184 4	123 17	247 9	−26 29	672
		1	3794	174 32	119 9	243 1	−27 23	672
		2	3306	284 26	125 13	249 5	+ 5 48	671
		3	3447	323 58	114 10	238 2	+13 3	673
		4	4472	81 12	84 38	208 30	−13 35	674
		5	6661	87 45	70 6	193 58	−20 36	674
		6	8710	85 32	49 56	173 48	−21 54	679
		7	8790	67 49	48 52	172 44	− 6 28	677
		8	7568	34 19	67 20	191 12	+17 11	675
		9	8219	36 20	60 50	184 42	+18 12	675
		3510	9616	41 47	40 24	164 16	+19 15	678
26	85 453	1	9682	266 41	183 14	293 7	+19 54	670
		2	5320	202 18	137 51	247 44	−26 40	672
		3	4797	191 24	130 53	240 46	−28 38	672
		4	4951	267 3	138 42	248 35	+ 5 11	671
		5	4345	293 35	128 19	238 12	+12 51	673
		6	4540	322 42	117 0	226 53	+19 41	673
		7	2604	95 18	98 22	208 15	−14 14	674
		8	4859	86 58	83 51	193 44	−16 48	674
		9	7791	87 19	61 10	171 3	−22 13	679
		3520	6198	24 38	81 35	191 28	+17 20	675
		1	6881	29 57	75 5	184 58	+17 17	675
		2	9414	86 48	40 29	150 22	−23 38	679
		3	7487	66 58	62 58	172 51	− 6 37	677
		4	8882	38 13	53 55	163 48	+19 15	678
29	88 633	5	9122	217 58	180 41	245 28	−26 11	672
		6	8650	214 35	173 39	238 26	−28 26	672
		7	8401	265 4	168 19	233 6	+13 52	673
		8	7720	269 27	160 40	225 27	+14 58	673
		9	4802	227 20	142 54	207 41	−13 34	674

1860	Day	No	Dist	Pos	Fr Node	H Long	H. Lat	Group
				° ′	° ′	° ′	° ′	
Mai 29		3530	2928	229 52	131 27	196 14	−10 16	674
		1	4482	307 5	126 52	191 39	+17 8	675
		2	4129	323 5	119 21	184 8	+17 20	675
		3	1561	317 22	117 16	182 3	+ 2 4	676
		4	3409	118 29	102 29	167 16	−22 27	679
		5	5229	6 40	97 17	162 4	+19 45	678
Apr 1	91 579	6	9161	232 28	184 33	207 33	−12 49	674
		7	7841	229 13	169 21	192 21	−15 15	674
		8	8227	270 0	168 4	191 4	+17 21	675
		9	7415	274 33	159 24	182 24	+17 36	675
		3540	5151	209 3	144 53	167 53	−22 38	679
		1	4861	245 7	146 43	169 43	− 4 52	677
		2	4932	323 59	122 49	145 49	+22 38	680
		3	5086	330 45	119 17	142 17	+24 2	680
		4	8038	72 13	63 55	86 55	−10 38	683
		5	8539	65 3	59 0	82 0	− 4 29	683
3	93 628	6	8143	220 10	173 30	167 26	−22 38	679
		7	7773	215 28	168 57	162 53	−25 37	679
		8	8364	246 22	176 9	170 5	− 1 10	677
		9	8305	242 2	175 53	169 49	− 4 49	677
		3550	9811	262 49	195 37	189 33	+17 22	675
		1	9386	264 23	186 5	180 1	+16 59	675
		2	4663	217 42	145 38	139 34	−17 20	681
		3	5208	62 13	88 21	82 17	− 4 36	683
4	94 597	4	9151	221 46	187 11	167 22	−22 27	679
		5	8568	217 21	178 50	159 1	−25 35	679
		6	9404	244 38	190 31	170 42	− 1 11	677
		7	9294	240 55	189 4	169 15	− 4 47	677
		8	9866	261 50	198 35	178 46	+16 45	675
		9	2140	78 44	108 37	88 48	− 9 13	683
		3560	2828	77 41	104 33	84 44	− 9 52	683
		1	3198	58 25	102 6	82 17	− 4 12	683
		2	5712	86 21	87 11	67 22	−17 53	684
		3	9773	41 31	46 21	26 32	+20 0	687
		4	9588	72 45	46 37	26 48	−10 30	686
6	96 579	5	8948	227 1	186 25	138 29	−17 31	681
		6	8312	223 33	178 33	130 37	−19 59	681
		7	1407	253 17	130 34	82 38	− 4 38	683
		8	8098	33 9	74 44	26 48	+20 11	687
		9	9529	83 55	49 30	1 34	−21 9	688
7	97 458	3570	3895	247 32	146 17	85 53	− 4 0	683
		1	3458	247 37	143 37	83 13	− 4 15	683
		2	4544	21 33	103 23	42 59	+12 2	685
		3	4969	22 45	100 50	40 26	+13 23	685
		4	6996	26 4	87 20	26 56	+20 21	687
		5	7407	35 58	80 40	20 16	+15 41	687
		6	8738	84 28	62 39	2 15	−21 5	688
		7	8684	43 59	66 19	5 55	+13 44	689
9	99 469	8	8658	271 58	179 55	90 59	+20 53	682
		9	8424	274 52	176 21	87 25	+22 12	682
		3580	4476	320 45	131 31	42 35	+19 56	685
		1	4636	353 49	115 42	26 46	+19 55	687
		2	4052	2 16	113 54	24 58	+15 1	687

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Apr 9		3583	4494	10 36	109 15	20 19	+15 21	687
		4	5130	14 20	105 1	16 5	+17 20	687
		5	6156	92 1	89 56	1 0	−21 45	688
		6	5987	27 50	95 20	6 24	+15 24	689
		7	7081	39 59	84 3	355 7	+12 6	689
		8	8122	29 28	78 40	349 44	+23 8	690
10	100 597	9	9639	268 4	197 8	92 12	+21 37	682
		3590	5126	292 7	147 18	42 22	+17 5	685
		1	5413	295 14	147 24	42 28	+19 36	685
		2	4355	323 9	131 22	26 26	+19 30	687
		3	3593	324 2	130 6	25 10	+14 54	687
		4	3686	336 3	125 39	20 43	+15 45	687
		5	4079	348 20	120 22	15 26	+17 24	687
		6	4321	106 28	106 35	1 39	−22 26	688
		7	3450	95 31	108 53	3 57	−15 57	688
		8	4577	9 20	110 29	5 33	+16 12	689
		9	5102	23 27	103 0	358 4	+13 53	689
		3600	5343	30 7	99 36	354 40	+11 59	689
		1	6872	19 38	94 3	349 7	+23 36	690
15	105 540	2	9415	262 25	198 59	23 57	+15 22	687
		3	9487	265 46	199 35	24 33	+18 43	687
		4	7562	226 27	180 3	5 1	−16 41	688
		5	7206	219 10	175 52	0 50	−21 23	688
		6	6909	214 47	172 28	357 26	−23 42	688
		7	7359	268 44	174 44	359 42	+14 2	689
		8	6749	268 31	170 7	355 5	+12 4	689
		9	6224	276 1	164 19	349 17	+14 44	691
		3610	5627	280 59	158 59	343 57	+14 59	691
		1	5857	14 47	107 13	292 11	+21 18	692
		2	9583	89 35	57 33	242 31	−26 6	696
		3	9764	50 3	55 42	240 40	+12 15	697
16	106 556	4	8454	221 8	189 23	359 56	−22 5	688
		5	9875	259 54	211 17	21 50	+14 43	687
		6	7646	268 26	178 14	348 47	+14 44	691
		7	7162	271 17	173 29	344 2	+15 8	691
		8	4789	355 48	121 27	292 0	+21 5	692
		9	9116	91 49	67 19	237 52	−27 28	696
		3620	7962	77 51	79 43	250 16	−14 13	695
		1	9052	47 43	69 49	240 22	+12 16	697
		2	9682	42 20	60 4	230 37	+19 23	697
17	107 485	3	8793	264 19	191 45	349 7	+14 59	691
		4	4436	330 49	134 50	292 12	+20 57	692
		5	6471	80 3	93 32	250 54	−14 16	695
		6	7246	79 50	87 17	244 39	−14 59	695
		7	8181	94 15	80 39	238 1	−27 28	696
		8	8018	44 7	82 57	240 19	+12 32	697
		9	9010	39 43	73 8	230 30	+19 14	697
18	108 512	3630	9549	262 15	204 30	347 18	+15 33	691
		1	4938	305 8	149 4	291 52	+20 30	692
		2	6159	99 36	100 46	243 34	−25 10	696
		3	7066	99 1	93 34	236 22	−27 41	696
		4	4696	85 28	107 34	250 22	−14 23	695
		5	5850	84 41	99 42	242 30	−16 3	695

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Apr 18		3636	6528	38 5	97 33	240 21	+12 31	697
		7	7977	34 49	86 56	229 44	+19 30	697
		8	9299	74 54	65 34	208 22	−11 52	698
21	111 363	9	5732	215 42	169 18	271 40	−20 6	693
		3640	5384	210 15	165 38	268 0	−21 51	693
		1	5206	230 49	168 0	270 22	−11 14	694
		2	2452	203 57	148 7	250 29	−13 56	695
		3	1944	168 47	139 56	242 18	−15 42	695
		4	3589	163 14	140 33	242 55	−25 34	696
		5	4049	142 18	131 34	233 56	−28 5	696
		6	3117	335 56	136 36	238 58	+13 11	697
		7	4548	356 21	126 43	229 5	+20 2	697
		8	5274	79 7	105 48	208 10	−11 50	698
		9	5978	81 17	101 7	203 29	−13 55	698
22	112 556	3650	7636	221 28	186 40	272 7	−20 37	693
		1	7150	217 50	181 41	267 8	−22 13	693
		2	4031	294 1	153 48	239 15	+13 9	697
		3	4316	323 3	143 30	228 57	+20 8	697
		4	9215	52 28	72 36	158 3	+ 9 11	700
25	115 581	5	9439	223 26	211 56	254 28	−21 48	696
		6	8469	263 13	196 33	239 5	+12 48	697
		7	7710	276 40	185 31	228 3	+20 38	697
		8	3674	333 14	141 51	184 23	+16 56	699
		9	4878	38 12	115 10	157 42	+ 8 36	700
		3660	5762	34 46	110 36	153 8	+12 55	700
		1	7340	77 7	94 12	136 44	−11 57	701
		2	8996	77 12	76 57	119 29	−12 57	704
28	118 595	3	1821	115 17	137 15	137 2	−12 9	701
		4	2467	97 10	131 48	131 35	−11 32	701
		5	4017	91 24	122 21	122 8	−14 0	704
		6	5322	92 20	114 23	114 10	−17 33	704
		7	8799	36 50	87 31	87 18	+22 35	707
		8	9632	39 30	73 26	73 13	+23 33	707
29	119 535	9	1741	193 19	151 15	137 42	−11 59	701
		3670	2347	104 56	134 21	120 48	−12 34	704
		1	3683	106 38	128 7	114 34	−17 53	704
		2	3698	347 35	140 26	126 53	+17 0	703
		3	3905	355 34	137 1	123 28	+17 21	703
		4	5995	34 31	113 8	99 35	+14 28	705
		5	7714	31 38	101 21	87 48	+22 30	707
		6	8950	36 25	86 37	73 4	+23 42	707
30	120 506	7	3587	220 37	165 18	137 59	−12 32	701
		8	1711	165 9	147 36	120 17	−13 42	704
		9	2547	139 51	141 46	114 27	−18 8	704
		3680	3876	314 41	154 19	127 0	+17 7	703
		1	3746	324 59	150 9	122 50	+17 29	703
		2	4367	21 47	127 10	99 51	+13 46	705
		3	6440	23 5	115 18	87 59	+22 21	707
		4	7965	32 14	99 51	72 32	+23 16	707
May 1	121 387	5	8073	261 8	198 50	159 1	+ 9 47	700
		6	5339	228 38	178 9	138 20	−12 28	701
		7	5025	206 37	171 30	131 41	−22 4	702
		8	2999	211 24	161 28	121 39	−13 33	704

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
		3689	2249	194 10	155 1	115 12	−14 2	704
May 1		3690	6118	349 13	137 15	97 26	+32 30	706
		1	6397	353 25	133 30	93 41	+33 37	706
		2	3276	357 5	139 51	100 2	+13 48	705
		3	5381	10 12	127 44	87 55	+22 35	707
		4	6933	25 44	111 44	71 55	+23 17	707
2	122 525	5	7305	232 19	194 21	138 24	−12 40	701
		6	6876	218 43	188 40	132 43	−21 19	702
		7	5361	226 1	179 0	123 3	−13 52	704
		8	4242	220 45	171 4	115 7	−13 57	704
		9	6011	327 2	154 22	98 25	+32 27	706
		3700	6244	336 58	147 17	91 20	+34 39	706
		1	4449	335 58	147 59	92 2	+22 28	707
		2	4475	347 42	142 22	86 25	+22 5	707
		3	4780	357 16	137 12	81 15	+22 37	707
		4	5581	11 41	127 18	71 21	+23 20	707
		5	7898	38 56	100 17	44 20	+18 33	709
		6	9305	47 22	81 47	25 50	+15 52	709
		7	9371	77 5	78 15	22 18	−11 39	710
3	123 660	8	8817	234 38	210 45	138 42	−12 4	701
		9	8433	223 31	205 14	133 11	−21 9	702
		3710	7399	231 10	196 6	124 3	−13 41	704
		1	6247	228 53	186 40	114 37	−13 43	704
		2	6710	307 32	171 28	99 25	+32 27	706
		3	6477	321 18	160 48	88 45	+34 56	706
		4	5084	307 30	164 22	92 19	+22 45	707
		5	4677	317 15	158 30	86 27	+22 27	707
		6	4745	347 55	143 3	71 0	+23 54	707
		7	3688	39 21	129 47	57 44	+ 6 6	708
		8	4296	46 25	125 11	53 8	+ 5 0	708
		9	6378	30 0	116 13	44 10	+19 2	709
		3720	7039	32 25	110 41	38 38	+20 10	709
		1	8215	44 23	96 55	24 52	+15 36	709
		2	8216	77 45	93 57	21 54	−11 27	710
		3	9102	77 45	83 29	11 26	−11 54	710
4	124 496	4	9527	234 55	222 13	138 18	−12 9	701
		5	8522	233 12	207 59	124 4	−13 13	704
		6	7550	231 28	198 14	114 19	−13 42	704
		7	7438	297 2	183 34	99 39	+31 55	706
		8	7097	308 14	174 3	90 8	+35 14	706
		9	5925	292 7	176 12	92 17	+21 42	707
		3730	5387	299 10	170 21	86 26	+21 52	707
		1	4591	326 37	154 43	70 48	+23 10	707
		2	5191	19. 25	127. 58	44 3	+18 55	709
		3	5677	21 44	124 29	40 34	+20 13	709
		4	7033	40 15	109. 8	25 13	+15 21	709
		5	1731	9 21	144 26	60 31	+ 4 43	708
		6	2740	33 29	136 32	52 37	+ 5 2	708
		7	6963	79 18	106 8	22 13	−11 27	710
		8	8067	78 39	96 18	12 23	−11 53	710
5	125 492	9	9470	233 37	222 4	124 2	−13 33	704
		3740	6737	267 13	190 36	92 34	+10 53	705
		1	7257	282 17	190 14	92 12	+22 11	707

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
		3742	6608	286 13	183 58	85 56	+21 50	707
May 5		3	8425	289 23	197 48	99 46	+32 21	706
		4	7731	298 57	185 49	87 47	+34 41	706
		5	2054	285 28	159 58	61 56	+ 3 53	708
		6	1463	337 40	150 38	52 36	+ 4 51	708
		7	4092	358 41	141 31	43 29	+18 44	709
		8	4649	4 7	137 36	39 34	+20 51	709
		9	5552	32 22	122 33	24 31	+15 6	709
		3750	5256	83 30	119 58	21 56	−11 43	710
		1	6544	80 20	110 28	12 26	−11 30	710
		2	9110	49 51	87 9	349 7	+13 46	712
		3	9405	38 59	84 46	346 44	+24 32	711
6	126 553	4	8409	261 11	207 26	94 20	+ 9 59	705
		5	8040	264 59	203 4	89 58	+12 14	705
		6	7993	278 0	199 13	86 7	+21 59	707
		7	9231	285 1	211 38	98 32	+32 57	706
		8	8500	292 5	198 27	85 21	+34 38	706
		9	6550	291 22	182 38	69 32	+24 10	707
		3760	4341	262 28	176 27	63 21	+ 3 32	708
		1	2713	278 23	165 10	52 4	+ 4 47	708
		2	3782	324 39	156 38	43 32	+18 12	709
		3	4202	335 46	152 20	39 14	+21 20	709
		4	3948	12 58	137 56	24 50	+15 14	709
		5	3206	92 55	134 46	21 40	−11 17	710
		6	7596	33 12	108 52	355 46	+22 26	711
		7	7940	46 52	101 53	348 47	+13 37	712
		8	8549	35 4	98 54	345 48	+24 46	711
7	127 485	9	9427	258 45	222 0	95 41	+ 9 44	705
		3770	8949	273 11	212 14	85 55	+21 24	707
		1	9713	282 11	223 40	97 21	+32 48	706
		2	9305	286 43	213 17	86 58	+34 41	706
		3	6199	255 31	190 24	64 5	+ 2 32	708
		4	4449	263 51	177 53	51 34	+ 4 19	708
		5	4588	300 22	169 27	43 8	+18 18	709
		6	3128	341 58	151 9	24 50	+14 47	709
		7	1676	126 55	147 46	21 27	−11 35	710
		8	2471	110 32	142 7	15 48	−12 58	710
		9	6353	24 43	122 20	356 1	+22 27	711
		3780	6615	42 20	114 43	348 24	+13 29	712
		1	7599	29 55	111 2	344 43	+24 51	711
9	129 644	2	9262	251 13	222 12	65 16	+ 2 6	708
		3	8114	254 40	208 22	51 26	+ 3 50	708
		4	7678	276 5	200 15	43 19	+19 13	709
		5	7162	277 35	195 30	38 34	+18 32	709
		6	4204	227 42	178 24	21 28	−11 2	710
		7	3066	217 0	170 19	13 23	−11 55	710
		8	4335	340 15	153 34	356 38	+22 29	711
		9	3282	7 32	145 8	348 12	+13 26	712
		3790	5258	3 52	139 59	343 3	+25 4	711
		1	5619	87 30	121 58	325 2	−13 32	714
		2	9763	78 56	77 10	280 14	−11 39	716
		3	7976	48 5	104 20	307 24	+13 32	715
		4	8312	43 18	102 8	305 12	+18 10	715

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
May 13	133 627	3795	9699	237 28	234 28	21 2	−11 32	710
		6	6744	219 13	197 30	344 4	−21 22	713
		7	7091	271 56	200 39	347 13	+14 15	712
		8	8339	278 30	210 6	356 40	+22 48	711
		9	7054	290 15	194 18	340 52	+25 41	711
		3800	4034	220 21	179 54	326 28	−13 27	714
		1	3363	204 57	173 9	319 43	−15 56	714
		2	3060	330 54	161 2	307 36	+14 57	715
		3	3409	345 21	156 13	302 47	+17 5	715
		4	4227	91 11	135 11	281 45	−11 40	716
		5	8274	99 30	106 8	253 42	−26 37	717
15	135 665	6	7672	233 20	209 44	327 24	−13 42	714
		7	6721	227 19	200 52	318 32	−16 20	714
		8	9304	264 51	227 29	345 9	+13 31	712
		9	9828	273 17	237 36	355 16	+23 3	711
		3810	9046	278 58	220 47	338 27	+25 24	711
		1	5689	276 36	191 39	309 19	+13 2	715
		2	4845	290 23	182 47	300 27	+16 17	715
		3	1617	173 33	162 51	280 31	−11 22	716
		4	5407	119 12	137 44	255 24	−26 34	717
		5	4951	109 29	136 47	254 27	−20 46	717
		6	9744	85 55	83 39	201 19	−16 45	718
20	140 450	7	6478	215 12	200 5	249 52	−23 32	717
		8	3366	124 48	153 13	203 0	−17 34	718
		9	4347	115 39	146 9	195 56	−19 34	718
		3820	5691	90 26	131 58	181 45	−12 36	719
		1	6546	93 20	126 20	176 7	−16 0	719
		2	7956	97 29	115 14	165 1	−22 9	721
		3	7533	48 20	119 3	169 50	+15 19	720
		4	8976	48 2	103 58	153 45	+19 18	722
21	141 458	5	7949	223 28	215 40	251 9	−22 37	717
		6	8066	218 47	215 35	251 4	−26 32	717
		7	2721	168 4	168 4	203 33	−17 20	718
		8	3229	144 46	160 35	196 4	−19 42	718
		9	3654	102 41	147 34	183 3	−12 40	719
		3830	4856	102 15	140 35	176 4	−16 6	719
		1	6578	103 12	129 22	165 51	−21 50	721
		2	9789	86 6	88 5	123 34	−15 7	724
		3	5944	42 9	133 34	169 3	+15 9	720
		4	7630	44 44	120 5	155 34	+18 28	722
		5	8100	43 57	115 55	151 24	+20 27	722
		6	9648	53 3	92 50	128 19	+16 47	723
22	142 454	7	9113	225 38	230 47	252 9	−23 57	717
		8	3754	201 4	181 36	202 58	−18 16	718
		9	2140	141 13	162 43	184 5	−13 9	719
		3840	2726	123 11	157 5	178 27	−13 55	719
		1	5079	113 30	143 17	164 39	−21 20	721
		2	4338	30 34	147 14	168 36	+14 51	720
		3	6113	38 43	134 25	155 47	+17 48	722
		4	6703	38 38	130 19	151 41	+19 51	722
		5	9253	86 55	99 56	121 18	−15 1	724
		6	8956	51 43	105 30	126 52	+16 41	723
		7	9873	62 59	86 46	108 8	+ 7 58	725

1860	Day	No	Dist	Pos	Fi Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
May 23	143 561	3848	9846	227 1	247 24	253 4	−24 32	717
		9	5538	219 45	197 37	203 17	−18 16	718
		3850	2465	191 58	175 24	181 4	−13 43	719
		1	3209	147 58	163 28	169 8	−19 34	721
		2	3880	137 15	158 9	163 49	−22 4	721
		3	4302	126 45	152 44	158 24	−22 0	721
		4	3006	358 13	163 1	168 41	+15 11	720
		5	4339	23 3	150 39	156 19	+17 30	722
		6	5103	25 27	146 5	151 45	+20 10	722
		7	7374	88 40	121 47	127 27	−13 25	724
		8	8006	88 52	116 4	121 44	−14 34	724
		9	9779	82 48	90 21	96 1	−11 10	726
		3860	7697	48 36	120 40	126 20	+16 31	723
		1	9262	62 30	100 56	106 36	+ 7 55	725
24	144 576	2	7139	227 35	218 1	209 17	−18 8	718
		3	4076	220 26	189 52	181 8	−13 33	719
		4	3638	209 54	185 13	176 29	−15 23	719
		5	3299	188 0	177 46	169 2	−18 32	721
		6	3584	170 26	172 16	163 32	−22 2	721
		7	3771	154 33	166 0	157 16	−23 13	721
		8	3239	316 16	177 24	168 40	+15 32	720
		9	3286	352 27	165 29	156 45	+17 24	722
		3870	6212	42 7	134 57	126 13	+16 51	723
		1	5750	93 24	135 49	127 5	−13 12	724
		2	6496	92 41	130 21	121 37	−14 16	724
		3	8078	60 46	116 5	107 21	+ 8 14	725
		4	9145	83 25	103 20	94 36	−10 57	726
		5	8599	92 39	111 17	102 33	−18 20	726
27	147 504	6	9065	239 39	236 13	185 57	−12 32	719
		7	7991	237 45	223 50	173 34	−12 45	719
		8	7038	225 41	213 14	162 58	−19 34	721
		9	2921	323 16	177 40	127 24	+14 52	723
		3880	2789	39 54	158 16	108 0	+ 7 44	725
		1	4980	94 10	143 42	93 26	−11 12	726
		2	5724	92 24	138 30	88 14	−11 45	726
		3	8853	106 49	113 53	63 37	−29 58	728
		4	7547	44 0	127 9	76 53	+20 42	727
		5	8307	41 52	120 30	70 14	+24 45	727
30	150 382	6	9871	235 2	254 48	163 43	−18 53	721
		7	4424	273 26	199 22	108 17	+ 7 47	725
		8	2763	211 56	186 34	95 29	−11 18	726
		9	2058	187 23	179 19	88 14	−11 31	726
		3890	5911	132 27	153 31	62 26	−30 44	728
		1	3621	352 20	171 24	80 19	+20 13	727
		2	3991	6 34	165 12	74 7	+20 52	727
		3	8901	87 55	112 28	21 23	−12 36	730
June 5	156 358	4	6758	279 2	220 18	44 26	+15 5	729
		5	4968	221 53	205 23	30 31	−16 14	730
		6	4263	206 45	197 8	21 16	−18 50	730
		7	3442	217 9	196 2	20 10	−12 29	730
		8	5041	325 17	192 3	16 11	+27 58	731
		9	4984	342 25	182 30	6 38	+29 43	731
		3900	7239	100 7	136 36	320 44	−16 53	734

1860	Day	No	Dist	Pos	☊ Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
June 5		3901	9412	94 37	111 13	295 21	−17 7	736
		2	6418	50 17	143 28	327 36	+16 21	733
		3	6882	52 5	139 34	323 42	+16 25	733
6	157 546	4	6866	232 55	221 58	29 15	−15 58	730
		5	5520	232 49	212 22	19 39	−12 47	730
		6	8035	276 48	232 57	40 14	+15 59	729
		7	6339	303 55	210 26	17 43	+27 42	731
		8	5593	319 16	198 39	5 56	+29 46	731
		9	5360	111 28	153 56	321 13	−17 31	734
		3910	4555	38 11	159 40	326 57	+16 37	733
		1	8292	98 22	127 34	294 51	−17 34	736
8	159 528	2	9470	241 34	253 26	32 37	−15 2	730
		3	8982	237 20	245 20	24 31	−17 56	730
		4	8474	242 11	239 55	19 6	−12 48	730
		5	8631	290 47	238 14	17 25	+28 19	731
		6	7674	297 56	225 36	4 47	+29 58	731
		7	6613	295 22	218 5	357 16	+24 7	732
		8	2868	335 32	186 50	326 1	+16 37	733
		9	5196	114 24	157 27	296 38	−17 41	736
		3920	6338	106 46	147 53	287 4	−17 34	736
		1	4422	43 13	161 11	300 22	+14 47	735
10	161 687	2	9537	289 41	255 8	3 41	+29 46	731
		3	9186	285 16	249 36	358 9	+24 39	732
		4	8851	288 29	244 4	352 37	+26 31	732
		5	5815	286 56	217 25	325 58	+16 34	733
		6	3279	179 23	189 0	297 33	−18 2	736
		7	3272	306 8	198 25	306 58	+14 34	735
		8	6590	96 44	145 47	254 20	−11 20	738
		9	7154	97 47	141 34	250 7	−13 7	738
11	162 596	3930	9505	286 35	255 59	351 39	+26 26	732
		1	7174	281 18	229 43	325 23	+16 22	733
		2	4946	288 56	212 21	308 1	+14 58	735
		3	4184	207 27	202 2	297 42	−18 16	736
		4	2833	8 21	180 33	276 13	+16 11	737
		5	4782	105 7	160 19	255 59	−11 27	738
		6	5898	103 42	152 52	248 32	−13 47	738
14	165 403	7	8264	237 7	241 48	297 39	−18 7	736
		8	9874	276 38	269 22	325 13	+16 30	733
		9	8988	275 53	251 57	307 48	+14 38	735
		3940	8495	279 42	245 28	301 19	+17 8	735
		1	2813	213 21	200 5	255 56	−10 41	738
		2	2821	188 35	194 6	249 57	−14 21	738
		3	7171	127 15	154 24	210 15	−30 42	740
		4	4461	121 35	168 33	224 24	−16 5	739
		5	4949	116 29	164 26	220 17	−16 0	739
		6	9169	99 14	124 7	179 58	−16 59	742
		7	9254	63 13	121 57	177 48	+16 0	743
18	169 554	8	6441	234 51	229 10	226 8	−15 42	739
		9	5716	229 10	222 44	219 42	−16 34	739
		3950	4337	210 15	209 8	206 6	−18 16	741
		1	4315	196 47	203 57	200 55	−21 23	741
		2	4120	161 58	188 22	185 20	−22 15	742
		3	3233	23 32	182 33	179 31	+17 28	743

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
June 18		3954	4126	43 13	173 13	170 11	+16 23	743
		5	8550	101 43	136 11	133 9	−15 56	746
		6	6859	54 46	152 36	149 34	+19 23	745
		7	7636	58 37	145 12	142 10	+18 36	745
		8	7562	53 4	147 8	144 6	+22 26	745
22	173 499	9	9531	243 40	266 54	207 54	−18 19	741
		3960	7992	243 19	247 6	188 6	−14 47	742
		1	3699	245 12	217 1	158 1	− 4 47	744
		2	4294	158 26	189 31	130 31	−22 20	746
		3	4666	139 51	180 26	121 26	−20 45	746
		4	3497	322 12	207 36	148 36	+19 17	745
		5	4223	324 58	209 13	150 13	+23 38	745
		6	2678	341 28	199 52	140 52	+17 9	745
		7	7976	110 48	147 39	88 39	−19 56	749
		8	8798	112 32	139 12	80 12	−23 59	749
		9	8844	101 52	136 17	77 17	−15 0	749
		3970	6525	67 39	156 48	97 48	+11 54	747
		1	7496	42 50	155 20	96 20	+30 48	748
25	176 616	2	6733	228 20	234 49	131 37	−21 43	746
		3	5584	220 35	224 34	121 22	−20 46	746
		4	4734	221 58	220 29	117 17	−16 33	746
		5	4065	200 42	210 7	106 55	−19 3	746
		6	9170	289 31	264 33	161 21	+23 17	745
		7	8036	287 55	251 4	147 52	+19 38	745
		8	8308	292 15	253 3	149 51	+23 41	745
		9	7750	295 25	246 38	143 26	+24 38	745
		3980	4433	128 40	180 4	76 52	−15 28	749
		1	1698	333 47	203 2	99 50	+11 27	747
		2	4783	355 11	199 22	96 10	+30 51	748
		3	8100	123 55	153 34	50 22	−28 48	750
		4	8616	120 10	146 31	43 19	−28 12	750
		5	9853	107 15	121 17	18 5	−21 21	753
		6	9817	98 53	121 34	18 22	−13 4	753
		7	7739	72 25	149 18	46 6	+11 16	751
		8	8572	71 47	140 56	37 44	+12 35	751
		9	8489	56 22	144 8	40 56	+25 22	752
26	177 336	3990	7694	234 14	245 4	131 39	−21 38	746
		1	6561	229 15	234 29	121 4	−20 38	746
		2	5919	233 42	231 35	118 10	−15 56	746
		3	5022	217 47	221 4	107 39	−19 22	746
		4	8872	286 18	261 32	148 7	+19 38	745
		5	8494	293 4	255 44	142 19	+24 36	745
		6	3464	147 36	190 32	77 7	−15 19	749
		7	2806	300 2	213 42	100 17	+11 33	747
		8	5023	339 49	209 10	95 45	+31 16	748
		9	7272	130 5	164 10	50 45	−28 40	750
		4000	7877	124 25	156 29	43 4	−27 52	750
		1	9330	108 40	134 3	20 38	−20 37	753
		2	9290	100 13	133 19	19 54	−12 46	753
		3	6552	70 5	160 4	46 39	+11 49	751
		4	7673	70 47	150 45	37 20	+12 44	751
		5	7598	54 16	154 33	41 8	+24 47	752
		6	8370	54 38	146 40	33 15	+26 46	752

1860	Day	No	Dist.	Pos	Fr Node	H Long	H. Lat	Group
July 1	182 576	4007	9037	245° 31′	266° 48′	79° 3′	−18° 32′	749
		8	8400	242 18	258 23	70 38	−19 19	749
		9	8156	246 20	256 52	69 7	−15 25	749
		4010	9651	300 2	278 47	91 2	+31 53	748
		1	7459	222 39	242 8	54. 23	−29 23	750
		2	6535	217 14	232 55	45 10	−27 29	750
		3	4740	287 3	232 10	44. 25	+11 41	751
		4	3871	300 6	224 47	37 2	+14 46	751
		5	5680	304 5	234 36	46 51	+22 14	752
		6	4785	318 13	224 34	36 49	+24. 27	752
		7	4593	329 48	219 0	31 15	+26 47	752
		8	3740	203 59	214. 59	27 14	−16 31	753
		9	2660	184. 1	206 48	19 3	−12 15	753
		4020	3752	171 37	202 41	14 56	−18 45	753
		1	4056	158 54	197 8	9 23	−19 27	753
		2	4690	30 2	188 58	1 13	+26 12	754
		3	5949	44. 52	176 5	348 20	+26 29	754
		4	4547	45 13	184. 12	356 27	+20 41	754
		5	5884	70 41	170 5	343 20	+12 25	755
		6	6889	69 56	162 40	334. 55	+14 24	755
		7	9245	107 28	139 53	312 8	−16 52	758
		8	9160	71 14	139 7	311 22	+16 21	757
3	184 563	9	9228	234 34	268 15	52 19	−29 34	750
		4030	8622	233 34	259 37	43 41	−27 42	750
		1	5256	238 11	234 30	18 34	−12 31	753
		2	5407	224 44	231 12	15 16	−18 58	753
		3	4762	214. 58	224 18	9 22	−19 22	753
		4	7971	280 52	259 29	43 33	+11 40	751
		5	7171	286 13	251 48	35 52	+14. 47	751
		6	8333	293 19	261 39	45 43	+22 11	752
		7	7447	299 36	251 31	35 35	+24 47	752
		8	6828	306 21	244 15	28 19	+27 12	752
		9	4072	338 59	215 42	359 46	+25 40	754
		4040	3107	345 13	211 24	355 28	+20 46	754
		1	3501	354. 14	208 40	352 44	+23 36	754
		2	3986	6 52	203 21	347 25	+26 24	754
		3	0950	325 53	209 57	354 1	+ 7 49	755
		4	0869	26 9	204 40	348 44	+ 7 40	755
		5	2108	42 34	198 26	342 30	+11 56	755
		6	3291	54 32	190 46	334. 50	+13 44	755
		7	7104	116 54	166 14	310 18	−17 6	758
		8	6772	68 30	165 47	309 51	+15 56	757
4	185 530	9	9773	237 49	281 31	51 52	−29 34	750
		4050	6846	246 50	248 11	18 32	−12 26	753
		1	6765	236 7	244. 36	14. 57	−18 51	753
		2	6007	230 47	237 39	8. 0	−18 52	753
		3	9043	280 33	272 32	42 53	+11 46	751
		4	8434	285 12	264 51	35 12	+15 20	751
		5	9258	292 5	274 57	45 18	+22 29	752
		6	8576	296 18	264 55	35 16	+24 53	752
		7	7964	301 33	256 57	27 18	+27 27	752
		8	5071	319 44	228 48	359 9	+26 8	754
		9	4042	317 32	224 30	354 51	+20 45	754

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
July 4		4060	4181	327 58	221 33	351 54	+24 9	754
		1	4204	341 10	216 12	346 33	+26 48	754
		2	3027	284 13	224 58	355 19	+ 7 43	755
		3	1804	292 47	217 27	347 48	+ 7 27	755
		4	1712	332 28	212 23	342 44	+12 7	755
		5	1977	18 14	204 5	334 26	+14 5	755
		6	5789	126 13	179 5	309 26	−17 25	758
		7	6339	120 24	173 40	304 1	−16 22	758
		8	5145	62 47	179 20	309 41	+16 6	757
		9	9678	113 8	135 25	265 46	−22 12	760
6	187 723	4070	9286	248 11	275 14	14 29	−18 47	753
		1	9430	255 46	278 56	18 11	−12 13	753
		2	6076	237 4	241 53	341 8	−16 14	756
		3	9714	298 23	286 2	25 17	+28 17	752
		4	7460	276 9	258 8	357 23	+ 6 53	755
		5	6784	277 59	252 32	351 47	+ 7 58	755
		6	5710	287 22	243 49	343 4	+12 43	755
		7	4573	294 8	235 22	334 37	+13 56	755
		8	7912	301 45	258 49	358 4	+26 51	754
		9	7368	296 59	254 55	354 10	+21 57	754
		4080	7178	301 37	252 8	351 23	+24 39	754
		1	6635	308 56	245 27	344 42	+27 26	754
		2	3557	179 46	209 51	309 6	−17 9	758
		3	2225	359 53	210 2	309 17	+16 23	757
		4	7712	123 6	165 49	265 4	−22 12	760
		5	8860	72 9	148 5	247 20	+17 33	761
8	189 580	6	5252	228 27	235 34	308 29	−17 14	758
		7	8515	283 28	269 56	342 51	+12 37	755
		8	9158	296 33	277 5	350 0	+24 53	754
		9	8666	300 48	269 30	342 25	+27 33	754
		4090	4582	300 21	236 13	309 8	+16 24	757
		1	4170	296 23	234 27	307 22	+13 46	757
		2	5360	145 34	192 14	265 9	−22 15	760
		3	6640	139 42	182 33	255 28	−26 33	760
		4	6163	66 40	175 45	248 40	+17 43	761
		5	6763	67 45	171 1	243 56	+18 17	761
		6	6459	73 24	172 29	245 24	+14 8	761
9	190 539	7	6640	239 38	248 45	308 3	−17 15	758
		8	9381	283 32	282 29	341 47	+12 44	755
		9	9710	296 26	288 54	348 12	+25 14	754
		4100	9396	299 56	281 43	341 1	+28 5	754
		1	6156	293 31	248 59	308 17	+16 30	757
		2	4623	166 13	205 9	264 27	−22 32	760
		3	4614	58 57	188 36	247 54	+17 49	761
		4	5266	62 8	183 50	243 8	+18 16	761
		5	9869	72 29	131 24	190 42	+19 16	762
11	192 633	6	9198	251 12	278 35	308 11	−17 34	758
		7	5425	217 13	234 11	263 47	−22 28	760
		8	9296	287 31	283 3	312 39	+15 36	757
		9	8760	288 29	275 33	305 9	+16 6	757
		4110	4798	300 37	240 43	270 19	+16 46	759
		1	1899	340 20	218 50	248 26	+14 11	761
		2	2446	346 33	218 38	248 14	+17 38	761

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	°	° ′	° ′	
July 11		4113	2713	3 40	214 16	243 52	+19 45	761
		4	8723	105 48	155 30	185 6	− 9 37	763
		5	8313	72 2	159 16	188 52	+19 5	762
12	193 714	6	6762	232 20	249 22	263 38	−22 29	760
		7	3895	310 57	234 22	248 38	+17 50	761
		8	6772	68 47	174 56	189 12	+19 9	762
13	194 482	9	7673	238 38	259 28	262 50	−22 37	760
		4120	5224	301 34	245 11	249 33	+18 5	761
		1	7350	107 35	170 42	174 4	− 7 33	764
		2	7933	107 20	165 33	168 55	− 8 29	764
		3	5581	64 58	185 13	188 35	+18 53	762
17	198 551	4	3051	236 27	234 7	179 47	− 6 24	764
		5	2475	199 1	223 45	169 25	− 9 11	764
		6	4282	312 22	241 19	186 59	+19 21	762
		7	4690	318 8	242 0	187 40	+22 58	762
		8	5780	130 32	191 11	136 51	−15 31	767
		9	8157	120 54	170 1	115 41	−17 55	769
		4130	8298	77 18	164 38	110 18	+17 13	770
18	199 572	1	6013	301 49	255 55	187 6	+19 22	762
		2	4490	251 58	245 36	176 47	− 5 56	764
		3	3756	235 53	238 15	169 26	− 9 15	764
		4	4134	150 26	207 6	138 17	−15 7	767
		5	6762	128 43	184 57	116 8	−17 55	769
		6	5408	85 5	188 45	119 56	+ 9 33	768
		7	6808	75 0	179 30	110 41	+17 15	770
		8	9563	116 31	151 15	82 26	−18 33	773
	199 715	9	6267	301 17	258 2	187 11	+19 37	762
		4140	6485	306 7	258 34	187 43	+23 3	762
		1	4726	251 58	247 8	176 17	− 6 33	764
		2	3977	239 41	240 22	169 31	− 8 54	764
		3	3955	153 40	208 59	138 8	−14 55	767
		4	6579	129 53	186 45	115 54	−17 51	769
		5	5137	84 27	190 45	119 54	+ 9 43	768
		6	6640	74 33	181 2	110 11	+17 19	770
		7	9528	116 44	152 6	81 15	−18 33	773
19	200 528	8	7401	298 1	268 38	186 15	+19 32	762
		9	7666	301 42	270 23	188 0	+22 44	762
		4150	6347	259 1	259 44	177 21	− 6 44	764
		1	5382	251 5	251 41	169 18	− 8 47	764
		2	3223	221 59	233 15	150 52	−10 17	765
		3	2906	213 9	229 55	147 32	−10 7	765
		4	3393	177 38	219 19	136 56	−14 43	767
		5	3528	164 24	214 33	132 10	−14 18	767
		6	5481	139 28	197 39	115 16	−17 45	769
		7	8872	120 3	163 37	81 14	−18 49	773
		8	9564	119 43	152 45	70 22	−21 8	773
		9	9522	117 19	153 4	70 41	−18 43	773
		4160	5287	70 47	192 13	109 50	+17 5	770
20	201 563	1	8672	296 30	282 53	185 49	+19 56	762
		2	8861	299 22	284 59	187 55	+22 40	762
		3	5032	245 13	249 3	151 59	−10 35	765
		4	4442	241 28	244 48	147 44	−10 4	765
		5	4264	161 0	212 10	115 6	−17 46	769

1860	Day	No	Dist.	Pos	Fr Node	H. Long	H. Lat.	Group
				° ′	° ′	° ′	° ′	
July 20		4166	3457	57 59	206 45	109 41	+17 2	770
		7	·8126	130 57	176 13	79 9	−24 9	773
		8	7752	125 26	177 41	80 37	−18 42	773
		9	8834	123 33	165 58	68 54	−21 13	773
		4170	·8612	121 6	167 53	70 49	−18 23	773
		1	9915	85 59	140 5	43 1	+10 51	775
		2	9913	73 12	139 34	42 30	+23 29	776
22	203 490	3	9935	296 45	309 37	185 13	+20 3	762
		4	7769	243 25	268 58	144 34	−21 51	766
		5	6590	248 33	261 31	137 7	−14 14	767
		6	4556	218 53	239 31	115 7	−17 47	769
		7	6322	186 25	224 28	100 4	−33. 58	771
		8	3385	173 46	220 24	96 0	−14 5	772
		9	4314	287 55	250 18	125 54	+ 9 13	768
		4180	2537	332 9	233 42	109 18	+16 58	770
		1	5051	151 25	206 52	82 28	−19 18	773
		2	5764	143 53	200 13	75 49	−20 8	773
		3	6652	137 53	192 22	67 58	−21 24	773
		4	9348	116 5	158 32	34 8	−15 42	777
		5	8391	87 35	167 50	43 26	+10 45	775
		6	8805	72 53	163 59	39 35	+23 40	776
24	205 629	7	9556	253. 33	296 1	141 17	−21 29	766
		8	7482	222. 15	257 17	102 33	−33 35	771
		9	7434	248 12	269 31	114 47	−17 47	769
		4190	5176	240 9	251 48	97 4	−13 42	772
		1	4571	208 11	236 39	81 55	−20 7	773
		2	4240	189 16	227 35	72 51	−19 43	773
		3	4510	175 55	221 15	66 31	−20 49	773
		4	8012	286 2	280 24	125 40	+ 9 33	768
		5	6175	298 53	263 58	109 14	+16 53	770
		6	6991	127 1	187 45	33 1	−15 42	777
		7	8096	123 21	177 21	22 37	−16 51	777
		8	8290	115 59	173 36	18 52	−11 41	777
		9	4962	85 2	197 40	42 56	+10 58	775
		4200	6140	64 28	193 4	38 20	+24 9	776
		1	9183	94 29	160 18	5 34	+ 5 9	778
		2	9851	72 34	145 48	351 4	+25 57	779
25	206 641	3	9732	252 6	300 35	131 30	−24 5	766
		4	8639	254. 10	283 36	114. 31	−17 48	769
		5	8415	232 25	272 18	103 13	−33 26	771
		6	5639	229 5	250 58	81 53	−20 20	773
		7	4866	216 3	241 51	72 46	−20 16	773
		8	4555	204 5	235 30	66 25	−20 37	773
		9	9179	287 0	294 55	125 50	+ 9 58	768
		4210	7733	295 52	278 13	109 8	+16 48	770
		1	5460	138 25	202 21	33 16	−15 39	777
		2	6727	131 57	192 8	23 3	−17 25	777
		3	6889	121 21	187 49	18 44	−11 27	777
		4	2901	77 51	212 1	42 56	+10 58	775
		5	4651	53 17	207 1	37 56	+24 11	776
		6	7870	95 43	176 4	6 59	+ 5 27	778
		7	9314	72 29	159 27	350 22	+26 5	779
30	211 545	8	9768	288 40	310 48	72 9	+ 9 13	774

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
July 30		4219	9649	257° 4′	303° 46′	65° 7′	−20° 45′	773
		4220	6992	252 22	272 11	33 32	−14 47	777
		1	5978	240 26	261 16	22 37	−17 32	777
		2	4279	165 42	221 56	343 17	−17 9	780
		3	7506	290 30	281 25	42 46	+11 18	775
		4	6452	305 54	271 1	32 22	+20 33	776
		5	6974	309 23	274 27	35 48	+23 57	776
		6	2667	282 5	248 11	9 32	+ 5 56	778
		7	1426	284 47	240 53	2 14	+ 6 16	778
		8	3648	27 1	226 5	347 26	+26 3	779
		9	4048	37 24	220 54	342 15	+26 39	779
		4230	4740	79 58	205 30	326 51	+14 36	781
		1	6499	84 42	192 37	313 58	+14 32	781
		2	7291	92 29	185 47	307 8	+ 9 43	781
		3	6404	123 51	196 11	317 32	−10 6	782
Aug 1	213 664	4	9406	263 41	302 14	33 31	−14 21	777
		5	8685	257 51	290 57	22 14	−17 0	777
		6	9697	291 41	311 11	42 28	+11 28	775
		7	9050	301 28	299 44	31 1	+20 42	776
		8	9253	306 6	302 34	33 51	+25 6	776
		9	6930	283 54	278 40	9 57	+ 6 1	778
		4240	5967	284 58	271 26	2 43	+ 6 53	778
		1	4798	329 21	255 37	346 54	+26 18	779
		2	4372	337 51	250 22	341 39	+26 57	779
		3	1590	5 18	235 43	327 0	+14 55	781
		4	1658	55 10	228 0	319 17	+12 39	781
		5	2693	67 22	221 28	312 45	+14 19	781
		6	3213	87 1	216 23	307 40	+10 6	781
		7	9795	128 6	160 41	251 58	−24 41	785
4	216 537	8	8478	310 5	294 21	344 53	+26 32	779
		9	6303	298 44	276 5	326 37	+14 55	781
		4250	4496	297 3	263 47	314 19	+11 55	781
		1	3405	294 56	257 7	307 39	+ 9 55	781
		2	6423	153 49	211 26	261 58	−24 36	783
		3	7478	145 57	200 28	251 0	−26 7	785
		4	6766	142 14	203 54	254 26	−20 34	783
		5	7939	135 45	192 8	242 40	−21 36	785
		6	9202	131 5	176 6	226 38	−23 21	786
		7	5336	119 36	206 54	257 26	− 3 50	784
5	217 563	8	9367	308 12	308 22	344 21	+25 52	779
		9	7902	297 12	290 43	326 42	+15 5	781
		4260	5563	291 3	272 17	308 16	+ 9 38	781
		1	5076	164 36	223 41	259 40	−20 33	783
		2	6365	158 18	214 55	250 54	−25 55	785
		3	6775	147 57	207 12	243 11	−23 24	785
		4	8264	136 56	190 22	226 21	−23 32	786
		5	8867	136 9	183 21	219 20	−25 42	786
7	219 630	6	8822	264 9	299 13	305 53	−13 53	782
		7	9774	298 17	319 14	325 54	+15 38	781
		8	8744	291 43	301 47	308 27	+10 7	781
		9	5212	229 47	259 22	266 2	−18 53	783
		4270	4886	217 58	252 49	259 29	−20 13	783
		1	5340	197 59	243 3	249 43	−25 48	785

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Aug 7		4272	5071	178 36	232 18	238 58	−23 1	785
		3	5661	161 46	221 39	228 19	−22 44	786
		4	6828	152 47	210 54	217 34	−25 36	786
		5	5392	99 10	207 46	214 26	+ 7 39	787
		6	6065	101 14	203 3	209 43	+ 6 24	787
		7	6725	80 29	199 28	206 8	+20 1	788
		8	8911	85 11	177 9	183 49	+19 13	789
		9	9686	132 48	170 11	176 51	−26 13	790
9	221 549	4280	7381	250 22	282 40	262 7	−19 28	783
		1	6264	232 46	267 22	246 49	−23 32	785
		2	5825	220 35	258 49	238 16	−25 17	785
		3	4957	205 20	248 11	227 38	−22 40	786
		4	5335	185 10	236 58	216 25	−25 19	786
		5	4664	257 7	266 53	246 20	− 6 29	784
		6	8292	142 26	195 43	175 10	−26 27	790
		7	1262	92 20	235 11	214 38	+ 7 48	787
		8	3189	60 18	228 21	207 48	+18 55	788
		9	4249	66 23	221 22	200 49	+21 1	788
		4290	6359	81 10	204 9	183 36	+19 27	789
		1	8588	88 0	182 54	162 21	+17 14	792
		2	9285	91 38	173 30	152 57	+14 6	792
10	222 592	3	8643	257 5	297 42	262 21	−19 52	783
		4	7892	254 40	289 23	254 2	−18 47	783
		5	7483	244 52	282 2	246 41	−23 34	785
		6	6627	238 19	273 1	237 40	−23 0	785
		7	5718	226 54	262 34	227 13	−22 46	786
		8	5446	207 45	251 9	215 48	−25 33	786
		9	7224	151 46	210 7	174 46	−26 33	790
		4300	1118	297 45	249 36	214 15	+ 7 49	787
		1	2177	17 4	242 46	207 25	+18 55	788
		2	4669	74 11	218 9	182 48	+19 27	789
		3	7173	87 25	197 49	162 28	+16 46	792
		4	8193	91 50	188 4	152 43	+14 9	792
		5	8921	87 51	179 46	144 25	+17 51	792
11	223 522	6	9413	261 38	310 21	261 49	−19 24	783
		7	8809	259 44	301 13	252 41	−18 38	785
		8	8490	252 19	295 5	246 33	−23 16	785
		9	7715	248 0	286 0	237 28	−22 51	785
		4310	6693	240 16	275 4	226 32	−22 31	786
		1	6098	224 37	263 41	215 9	−25 50	786
		2	6303	163 52	222 56	174 24	−26 31	790
		3	3150	290 21	262 35	214 3	+ 7 48	787
		4	2885	333 29	255 49	207 17	+18 45	788
		5	3094	57 16	231 32	183 0	+19 29	789
		6	5558	83 37	211 34	163 2	+17 8	792
		7	6793	91 18	201 32	153 0	+14 2	792
		8	7623	87 40	194 45	146 13	+17 21	792
		9	8999	134 48	186 14	137 42	−23 11	793
14	226 485	4320	9532	260 4	314 41	224 7	−22 17	786
		1	8416	291 9	304 39	214 5	+ 7 51	787
		2	7646	305 19	296 37	206 3	+18 55	788
		3	4721	314 55	272 55	182 21	+19 5	789
		4	2112	344 18	253 43	163 9	+16 52	792

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Aug 14		4325	2442	23 46	245 5	154 31	+20 33	792
		6	1494	46 27	242 38	152 4	+13 58	792
		7	2522	56 17	237 17	146 43	+17 34	792
		8	3493	205 5	250 18	159 44	−13 29	791
		9	5797	163 59	227 36	137 2	−23 6	793
17	229 492	4330	5862	228 49	269 34	136 21	−23 27	793
		1	9022	304 58	314 59	181 46	+19 1	789
		2	7203	303 28	295 54	162 41	+16 27	792
		3	6217	312 32	286 46	153 33	+20 54	792
		4	5674	302 36	284 11	150 58	+14 19	792
		5	4602	319 3	274 28	141 15	+20 12	792
		6	6998	144 4	213 47	80 34	−19 26	794
		7	8459	135 30	198 0	64 47	−19 38	796
		8	7256	93 7	203 27	70 14	+14 43	795
		9	7926	72 10	200 34	67 21	+31 23	797
		4340	9768	83 36	170 50	37 37	+24 18	799
20	232 484	1	9530	301 14	326 7	150 27	+14 38	792
		2	4871	172 56	240 17	64 37	−19 23	796
		3	5433	151 52	228 58	53 18	−15 47	798
		4	5141	77 13	224 44	49 4	+21 16	799
		5	4638	41 51	240 13	64 33	+31 42	797
		6	6702	78 38	213 9	37 29	+24 28	799
21	233 518	7	4434	201 2	255 9	64 49	−19 17	796
		8	4337	174 18	243 19	52 59	−16 28	798
		9	4157	17 51	254 8	63 48	+31 20	797
		4350	3351	61 25	239 47	49 27	+20 48	799
		1	5108	70 21	227 46	37 26	+24 28	799
		2	9872	81 17	170 57	340 37	+27 44	803
26	238 510	3	8632	246 55	306 20	45 12	−31 19	800
		4	8335	243 57	301 35	40 27	−31 37	800
		5	8568	265 40	313 10	52 2	−16 28	798
		6	2943	237 45	269 11	8 3	− 6 27	801
		7	7635	306 38	308 30	47 22	+17 20	799
		8	8922	321 20	321 15	60 7	+31 11	797
		9	6639	319 39	297 56	36 48	+24 44	799
		4360	4055	357 42	268 45	7 37	+28 54	802
		1	3445	12 28	261 34	0 26	+26 55	802
		2	4324	49 56	244 29	343 21	+28 42	803
		3	5089	63 49	235 16	334 8	+27 52	803
		4	6465	96 7	218 32	317 24	+14 11	804
27	239 515	5	9356	253 38	320 22	44 58	−30 28	800
		6	9077	251 8	314 53	39 29	−30 53	800
		7	5007	266 1	286 57	11 33	− 5 29	801
		8	8983	305 55	324 19	48 55	+17 17	799
		9	8037	315 49	312 23	36 59	+24 45	799
		4370	9640	320 39	335 38	60 14	+31 15	797
		1	5254	337 54	283 30	8 6	+29 18	802
		2	4487	344 48	276 45	1 21	+28 9	802
		3	3756	22 11	258 50	343 26	+29 0	803
		4	3992	45 7	248 44	333 20	+28 3	803
		5	9942	129 48	178 58	263 34	−18 35	807
28	240 565	6	9656	255 51	328 13	37 56	−30 40	800
		7	9797	306 7	340 29	50 12	+16 46	799

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Aug 28		4378	9150	314 9	327 30	37 13	+24 33	799
		9	6158	327 3	294 26	4 9	+27 26	802
		4380	4481	346 46	277 6	347 49	+28 37	803
		1	3615	14 50	263 1	332 44	+28 4	803
		2	9715	96 49	183 23	253 6	+14 49	808
		3	9482	132 56	193 21	263 4	−18 42	807
29	241 569	4	7297	322 37	305 58	1 26	+27 50	802
		5	5880	331 2	292 14	347 42	+28 28	803
		6	4232	348 18	276 29	331 57	+27 44	803
		7	8630	137 21	207 25	262 53	−18 43	807
		8	9772	132 38	187 46	243 14	−19 37	809
		9	9828	138 13	187 22	242 50	−25 19	809
		4390	8926	97 36	197 53	253 21	+14 50	808
		1	9902	94 57	178 19	233 47	−16 29	810
30	242·667	2	7500	322 42	308 58	348 52	+28 12	803
		3	5610	331 8	291 33	331 27	+27 25	803
		4	7318	144 43	223 2	262 56	−18 32	807
		5	9203	141 3	202 16	242 10	−24 6	809
		6	9044	136 28	203 4	242 58	−19 25	809
		7	5577	95 40	229 13	269 7	+14 22	805
		8	7563	97 11	213 29	253 23	+15 1	808
		9	9358	96 8	192 33	232 27	+16 20	810
31	243 529	4400	6844	323 53	303 48	331 28	+27 10	803
		1	6165	154 2	235 18	262 58	−18 28	807
		2	8472	145 38	213 53	241 33	−24 6	809
		3	8211	141 11	214 49	242 29	−19 36	809
		4	9631	137 8	194 8	221 48	−22 35	813
		5	6120	95 54	226 8	253 48	+14 56	808
		6	8513	96 16	204 49	232 29	+16 23	810
		7	9347	117 54	195 24	223 4	− 3 40	812
Sept 1	244 564	8	8116	320 28	317 37	330 37	+27 34	803
		9	4930	171 32	249 42	262 42	−18 19	807
		4410	6226	169 32	243 25	256 25	−25 10	807
		1	7353	153 9	228 1	241 1	−23 33	809
		2	6973	149 15	229 2	242 2	−19 29	809
		3	8907	141 3	208 3	221 3	−22 17	813
		4	4153	90 24	241 5	254 5	+15 5	808
		5	7079	94 25	219 46	232 46	+17 2	810
		6	8250	120 25	210 9	223 9	− 3 16	812
2	245 446	7	8991	318 29	329 40	330 9	+27 11	803
		8	4368	193 53	261 58	262 27	−18 24	807
		9	6392	163 20	239 59	240 28	−23 35	809
		4420	5920	160 26	241 6	241 35	−19 52	809
		1	8070	146 18	219 48	220 17	−22 21	813
		2	6902	136 9	225 52	226 21	−11 7	811
		3	6972	124 3	222 41	223 10	− 3 22	812
		4	2394	76 10	253 55	254 24	+14 57	808
		5	5664	92 44	231 41	232 10	+16 30	810
		6	6590	90 27	225 5	225 34	+19 14	810
3	246 504	7	9708	318 23	344 17	329 46	+27 21	803
		8	4633	223 23	276 48	262 17	−18 24	807
		9	5488	180 52	254 10	239 39	−23 42	809
		4430	4884	180 22	255 36	241 5	−19 53	809

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Sept 3		4431	6901	155 15	233 50	219 19	−22 13	813
		2	5008	148 17	242 25	227 54	−10 42	811
		3	9806	98 37	186 43	172 12	+14 22	814
		4	1410	4 8	269 5	254 34	+14 50	808
		5	4084	82 31	244 38	230 7	+18 10	810
		6	4940	84 52	238 52	224 21	+19 17	810
4	247 525	7	5663	244 11	290 59	261 59	−18 14	807
		8	5159	202 18	267 37	238 37	−23 46	809
		9	4588	206 36	269 42	240 42	−19 57	809
		4440	5704	169 18	248 9	219 9	−21 47	813
		1	3492	173 20	257 43	228 43	−10 41	811
		2	2393	59 23	258 49	229 49	+18 1	810
		3	3316	69 45	252 31	223 31	+19 47	810
		4	9108	99 36	201 11	172 11	+14 21	814
5	248 481	5	6908	256 7	304 15	261 41	−18 16	807
		6	7065	273 4	310 39	268 5	− 8 11	806
		7	5491	222 53	280 34	238 0	−23 49	809
		8	5136	229 38	282 56	240 22	−20 7	809
		9	4904	190 6	262 5	219 31	−21 24	813
		4450	3150	212 37	271 44	229 10	−10 50	811
		1	4100	315 9	291 29	248 55	+15 42	808
		2	1996	3 54	272 16	229 42	+18 1	810
		3	2240	32 12	266 9	223 35	+19 51	810
		4	7972	99 48	215 16	172 42	+14 18	814
		5	9651	98 30	192 35	150 1	+15 12	815
7	250 557	6	9230	269 20	333 27	261 26	−18 24	807
		7	7725	250 29	309 44	237 43	−25 47	809
		8	7541	257 49	311 31	239 30	−20 13	809
		9	6401	243 17	297 9	225 8	−22 40	813
		4460	5961	233 30	289 52	217 51	−23 59	813
		1	5786	263 9	301 7	229 6	−10 26	811
		2	9155	281 59	335 12	263 11	− 6 52	806
		3	5310	316 34	301 12	229 11	+18 30	810
		4	4760	324 42	296 3	224 2	+21 0	810
		5	4495	94 49	244 26	172 25	+14 24	814
		6	7565	99 18	221 9	149 8	+14 53	815
		7	9223	92 59	202 25	130 24	+21 1	816
11	254 421	8	9636	264 23	342 57	216 8	−25 37	813
		9	4470	314 22	299 53	173 4	+15 32	814
		4470	1380	12 53	275 49	149 0	+14 54	815
		1	3475	61 25	260 59	134 10	+22 49	816
		2	8225	103 49	218 32	91 43	+12 5	818
12	255 422	3	6325	308 45	314 20	173 19	+14 56	814
		4	2699	324 18	289 8	148 7	+14 47	815
		5	2738	26 17	274 32	133 31	+22 56	816
		6	3097	101 58	257 24	116 23	+10 25	817
		7	6950	103 11	231 4	90 3	+12 29	818
13	256 459	8	7947	307 30	329 13	173 29	+15 2	814
		9	4710	312 32	303 42	147 58	+14 56	815
		4480	3417	347 14	289 3	133 19	+22 47	816
		1	0894	68 0	272 41	116 57	+10 47	817
		2	4905	100 48	247 7	91 23	+12 38	818
14	257 438	3	9100	307 21	343 29	173 52	+14 56	814

1860	Day	No	Dist	Pos	Fi Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Sept 14		4484	6539	308 19	318 1	148 24	+14 36	815
		5	4925	328 47	303 11	133 34	+22 37	816
		6	4034	339 12	295 15	125 38	+23 18	816
		7	1890	314 49	287 35	117 58	+10 48	817
		8	1034	319 20	282 41	113 4	+ 9 35	817
		9	2720	92 46	262 17	92 40	+12 32	818
		4490	9466	109 38	205 44	36 7	+ 6 34	822
		1	9771	150 55	207 28	37 51	−33 34	823
15	258 492	2	9784	308 34	357 34	173 0	+15 21	814
		3	8084	308 2	332 34	148 0	+15 14	815
		4	6551	321 15	317 26	132 52	+22 45	816
		5	5596	326 7	309 20	124 46	+23 12	816
		6	0972	30 16	277 42	93 8	+12 37	818
		7	8319	111 33	221 49	37 15	+ 6 15	822
		8	7957	100 5	225 19	40 45	+15 36	821
		9	5455	161 8	255 26	70 52	−16 50	820
		4500	9300	154 59	220 29	35 55	−33 39	823
		1	9562	149 33	213 14	28 40	−30 39	823
21	264 452	2	9447	254 29	344 42	75 36	−34 48	819
		3	5534	235 9	301 25	32 19	−21 55	824
		4	4922	292 58	313 37	44 31	+ 4 58	822
		5	3776	294 12	306 23	37 17	+ 6 4	822
		6	4083	316 37	307 14	38 8	+14 57	821
		7	3747	2 54	293 19	24 13	+27 4	825
		8	5651	149 12	255 38	346 32	−12 16	827
		9	8428	145 38	233 16	324 10	−20 55	829
		4510	7879	131 37	234 33	325 27	− 8 22	830
		1	7616	86 14	236 19	327 13	+26 21	828
24	267 446	2	7677	326 20	335 6	23 32	+27 45	825
		3	2863	299 32	303 48	352 14	+ 7 42	826
		4	2334	299 33	300 38	349 4	+ 7 35	826
		5	3678	236 9	298 6	346 32	−11 39	827
		6	3162	170 20	276 33	324 59	− 8 10	830
		7	5191	181 48	274 10	322 36	−21 34	829
		8	3850	47 47	277 42	326 8	+27 33	828
		9	4569	59 30	270 17	318 43	+28 45	828
30	273 443	4520	8519	280 6	349 4	312 26	− 9 54	830
		1	9513	285 16	3 31	326 53	− 8 7	830
		2	9180	322 2	359 55	323 17	+26 22	828
		3	2803	193 47	289 36	252 58	− 9 14	832
		4	4944	154 28	269 50	233 12	−11 45	834
		5	6758	167 23	265 8	228 30	−25 56	835
		6	7817	156 20	251 52	215 14	−25 22	835
		7	8884	150 33	238 20	201 42	−26 26	836
		8	8340	132 53	239 4	202 26	−10 5	837
		9	2766	74 27	280 37	243 59	+17 0	833
		4530	3150	80 16	277 38	241 0	+16 57	833
Oct 2	275 452	1	8060	278 59	346 12	281 4	− 9 44	831
		2	4657	262 5	317 55	252 47	− 9 6	832
		3	3140	214 50	297 47	232 39	−11 31	834
		4	5320	202 56	293 7	227 59	−25 27	835
		5	5763	181 45	279 48	214 40	−25 15	835
		6	6967	167 6	265 36	200 28	−27 0	836

1860	Day	No	Dist	Pos	Fi Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Oct 2		4537	6136	143 37	261 29	196 21	−10 58	837
		8	9792	102 4	215 43	150 35	+15 7	839
3	276 506	9	9243	282 7	1 32	281 27	−10 25	831
		4540	6394	274 12	332 45	252 40	− 8 42	832
		1	4234	249 9	313 8	233 3	−11 50	834
		2	5584	225 31	307 48	227 43	−25 22	835
		3	5253	204 25	295 1	214 56	−25 5	835
		4	5974	182 23	280 26	200 21	−26 47	836
		5	6581	174 7	272 51	192 46	−27 51	836
		6	9140	102 39	229 26	149 21	+15 1	839
		7	9846	94 45	214 39	134 34	+22 14	840
4	277 456	8	9778	284 4	13 9	279 35	−10 28	831
		9	7739	279 50	345 26	251 52	− 8 25	832
		4550	5638	264 1	326 3	232 29	−11 53	834
		1	6316	241 2	320 24	226 50	−25 18	835
		2	5544	200 9	293 13	199 39	−26 56	836
		3	5727	192 0	287 55	194 21	−27 15	836
		4	6025	105 30	260 1	166 27	+11 35	838
		5	8229	102 32	241 26	147 52	+14 55	839
		6	9537	95 22	223 37	130 3	+21 50	840
		7	9283	107 54	228 23	134 49	+10 9	839
6	279 534	8	9821	286 10	16 45	253 43	− 8 42	832
		9	8585	277 50	355 18	232 16	−12 22	834
		4560	8464	260 45	348 34	225 32	−25 28	835
		1	6363	239 42	321 56	198 54	−26 14	836
		2	1738	83 18	290 34	167 32	+11 37	838
		3	2605	95 41	284 45	161 43	+11 20	838
		4	4930	96 56	270 27	147 25	+14 55	839
		5	6298	107 17	260 0	136 58	+10 34	839
		6	7359	92 51	252 48	129 46	+21 25	840
		7	8097	106 44	244 46	121 44	+11 28	842
		8	8775	104 19	237 20	114 18	+13 33	842
8	281 400	9	9793	268 14	14 28	224 58	−25 54	835
		4570	8577	264 39	353 13	203 43	−23 5	835
		1	8309	259 19	348 14	198 44	−25 53	836
		2	2994	315 12	317 40	168 10	+11 25	838
		3	2076	326 16	311 29	161 59	+11 58	838
		4	1682	54 20	296 17	146 47	+14 39	839
		5	2484	99 20	287 2	137 32	+10 8	839
		6	4414	79 6	278 54	129 24	+21 10	840
		7	4726	107 10	272 48	123 18	+ 9 46	842
		8	6032	102 33	264 6	114 36	+13 13	842
9	282 599	9	9293	265 45	4 18	197 47	−25 30	836
		4580	9484	269 59	8 54	202 23	−22 38	836
		1	2356	336 29	312 49	146 18	+14 40	839
		2	0725	7 23	303 29	136 58	+ 9 59	839
		3	2876	48 49	295 23	128 52	+21 23	840
		4	2052	96 14	290 54	124 23	+10 0	842
		5	3767	95 6	281 4	114 33	+13 30	842
		6	9654	98 58	226 20	59 49	+18 23	843
		7	9214	104 13	234 29	67 58	+13 33	843
12	285 510	8	6037	244 38	328 51	121 3	−22 49	841
		9	5674	237 0	323 20	115 32	−23 32	841

1860	Day	No	Dist	Pos	Fi Node	II Long	II Lat	Group
				° ′	° ′	° ′	° ′	
Oct 12		4590	6364	305 11	344 33	136 45	+10 8	839
		1	5564	327 13	335 48	128 0	+21 36	840
		2	4925	306 57	334 22	126 34	+10 18	842
		3	3092	314 54	322 19	114 31	+11 14	842
		4	6773	98 33	262 59	55 11	+16 19	843
		5	8758	137 14	247 17	39 29	−15 4	844
		6	9503	194 51	235 58	28 10	−15 29	844
14	287 638	7	8818	268 18	3 38	125 39	−21 19	841
		8	8184	261 47	354 25	116 26	−23 45	841
		9	9226	305 6	14 49	136 50	+10 18	839
		4600	8381	304 22	4 17	126 18	+ 9 52	842
		1	8543	318 29	5 22	127 23	+21 52	840
		2	2699	73 50	295 14	57 15	+16 3	843
		3	3318	81 40	290 41	52 42	+16 19	843
		4	5539	159 0	282 4	44 5	−16 48	844
		5	5942	151 5	276 57	38 58	−14 48	844
		6	7278	143 27	265 10	27 11	−15 6	844
		7	7764	140 3	260 9	22 10	−14 18	844
		8	8673	129 55	248 49	10 50	− 8 46	844
16	289 663	9	9744	270 43	22 7	115 24	−23 15	841
		4610	9950	305 9	33 58	127 15	+ 9 26	842
		1	9918	317 51	33 12	126 29	+22 7	840
		2	3713	213 9	311 48	45 5	−15 58	844
		3	3596	193 47	304 34	37 51	−14 55	844
		4	4286	191 22	302 30	35 47	−18 50	844
		5	4330	170 50	294 9	27 26	−15 12	844
		6	4754	158 50	288 9	21 26	−13 30	844
		7	5804	139 4	276 34	9 51	− 8 18	844
		8	3247	333 7	324 47	58 4	+16 34	843
		9	2509	345 26	318 56	52 13	+16 24	843
		4620	9912	132 50	228 57	322 14	−15 35	848
17	290 492	1	4263	238 37	323 39	45 11	−15 39	844
		2	3668	222 2	315 54	37 26	−15 6	844
		3	4168	213 33	313 12	34 44	−18 49	844
		4	3611	194 39	305 42	27 14	−15 8	844
		5	3699	177 56	299 39	21 11	−13 31	844
		6	4353	149 4	288 22	9 54	− 8 30	844
		7	4717	320 54	336 22	57 54	+16 17	843
		8	8478	83 8	254 27	335 59	+30 40	847
		9	9651	134 44	237 49	319 21	−16 15	848
19	292 505	4630	6127	255 43	341 24	34 23	−18 38	844
		1	6199	262 37	344 18	37 17	−15 23	844
		2	5018	252 10	333 54	26 53	−15 19	844
		3	4227	246 20	328 14	21 13	−13 36	844
		4	3854	219 46	317 26	10 25	−16 34	844
		5	2614	227 50	317 35	10 34	− 8 40	844
		6	8063	312 55	5 26	58 25	+16 43	843
		7	6415	166 26	285 19	338 18	−24 46	846
		8	4749	168 29	294 26	347 25	−16 56	845
		9	7727	140 36	265 27	318 26	−15 2	848
		4640	6521	143 6	275 33	328 32	−12 55	848
		1	8187	138 14	260 35	313 34	−14 41	848
		2	5905	68 38	284 28	337 27	+30 26	847

1860	Day	No	Dist	Pos	Fr Node.	H Long	H Lat.	Group
Oct 20	293 418	4643	7470	265° 2′	355° 16′	35° 18′	−18° 40′	844
		4	7499	269 45	357 0	37 2	−15 33	844
		5	6369	263 42	346 43	26 45	−15 27	844
		6	5516	261 13	340 33	20 35	−13 36	844
		7	3844	257 48	330 36	10 38	− 8 40	844
		8	3858	191 39	307 12	347 14	−16 37	845
		9	5425	181 35	298 42	338 44	−24 23	846
		4650	6429	147 7	278 18	318 20	−15 3	848
		1	6541	148 53	278 6	318 8	−16 27	848
22	295 453	2	9565	278 0	25 30	36 40	−15 19	844
		3	8885	275 18	14 28	25 38	−15 33	844
		4	8379	276 29	9 0	20 10	−13 5	844
		5	7263	279 15	359 27	10 37	− 8 17	844
		6	5238	261 41	341 10	352 20	−12 28	845
		7	3975	184 30	306 17	317 27	−16 37	848
		8	3668	184 54	307 10	317 20	−14 55	848
		9	8913	129 7	253 36	264 46	− 9 26	851
24	297 586	4660	9614	285 47	29 52	10 47	− 7 58	844
		1	4881	246 18	336 25	317 20	−17 0	848
		2	4809	251 3	337 45	318 40	−15 3	848
		3	1638	184 44	313 42	294 37	− 3 53	849
		4	6128	171 3	294 28	275 23	−25 42	850
		5	5823	139 14	284 28	265 23	− 9 21	851
		6	9888	143 50	239 32	220 27	−26 58	853
		7	9887	117 39	236 4	216 59	− 1 18	854
28	301 448	8	9482	275 25	29 40	315 47	−16 58	848
		9	9549	277 48	31 22	317 29	−14 58	848
		4670	4145	261 40	341 18	267 25	− 8 53	851
		1	2285	233 38	327 11	253 18	− 7 1	851
		2	6895	164 54	290 50	216 57	−27 47	853
		3	5954	126 0	285 13	211 20	− 2 47	854
		4	7022	124 27	277 8	203 15	− 3 17	854
		5	3148	78 55	305 42	231 49	+15 2	852
		6	3635	81 44	302 35	228 42	+15 47	852
29	302 453	7	7529	253 26	0 46	272 39	−26 24	850
		8	6006	273 1	356 7	268 0	− 9 14	851
		9	4141	265 0	343 2	254 55	− 7 44	851
		4680	1848	30 6	320 54	232 47	+15 0	852
		1	2154	52 48	315 55	227 48	+15 20	852
		2	3046	142 18	306 14	218 7	− 3 45	854
		3	4009	132 10	299 28	211 21	− 2 42	854
		4	5279	128 39	291 7	203 0	− 3 22	854
		5	5946	177 58	304 15	216 8	−27 39	853
30	303 492	6	8751	261 55	17 30	274 38	−25 48	850
		7	8279	259 2	11 9	268 17	−25 59	850
		8	6201	276 30	359 14	256 22	− 7 41	851
		9	2972	334 58	336 28	233 36	+15 14	852
		4690	2679	354 17	331 5	228 13	+17 35	852
		1	1301	158 59	317 36	214 44	− 0 52	854
		2	1974	153 25	314 6	211 14	− 2 46	854
		3	3155	138 22	306 11	203 19	− 3 5	854
		4	5369	197 9	318 20	215 28	−27 42	853
		5	9907	103 30	240 19	137 27	+11 44	858

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Nov 1	305 478	4696	9899	267 39	43 31	272 29	−25 43	850
		7	6067	234 13	344 48	213 46	−27 49	853
		8	4213	278 35	348 45	217 43	− 2 48	854
		9	3161	273 0	341 58	210 56	− 2 39	854
		4700	2178	257 11	334 52	203 50	− 3 28	854
		1	6941	314 13	7 42	236 40	+16 36	852
		2	0666	73 55	322 0	190 58	+ 6 36	856
		3	8201	102 47	269 58	138 56	+11 54	858
		4	9065	105 18	259 49	128 47	+10 0	858
		5	8878	136 43	265 37	134 35	−17 33	859
		6	9249	137 53	260 44	129 42	−19 49	859
2	306 461	7	7003	246 38	357 58	212 59	−27 38	853
		8	7077	249 45	0 2	215 3	−26 19	853
		9	6194	284 7	3 22	218 23	− 3 2	854
		4710	5079	281 52	355 32	210 33	− 2 44	854
		1	8427	311 47	22 47	237 48	+16 54	852
		2	7710	309 21	15 50	230 51	+14 10	852
		3	6758	100 58	283 50	138 51	+11 54	858
		4	7905	104 51	273 46	128 47	+ 9 53	858
		5	8490	100 18	268 1	123 2	+13 56	858
		6	7758	140 27	279 18	134 19	−17 13	859
		7	8277	142 9	274 52	129 53	−20 14	859
3	307 506	8	8048	255 8	11 41	211 52	−27 32	853
		9	8152	257 53	13 51	214 2	−26 2	853
		4720	7905	287 21	18 33	218 44	− 2 51	854
		1	6903	286 13	9 57	210 8	− 2 31	854
		2	9461	310 40	38 6	238 17	+16 59	852
		3	4362	338 0	346 33	186 44	+21 15	857
		4	4574	104 13	300 0	140 11	+ 7 58	858
		5	4963	96 9	298 11	138 22	+12 11	858
		6	5804	84 35	294 35	134 46	+19 51	858
		7	6284	103 10	288 20	128 31	+ 9 51	858
		8	7072	97 34	282 42	122 53	+14 22	858
		9	6341	147 5	293 20	133 31	−16 54	859
		4730	7028	148 33	288 58	129 9	−20 18	859
		1	7890	148 20	281 46	121 57	−23 34	859
4	308 532	2	9008	260 31	25 56	211 35	−27 38	853
		3	7336	261 56	9 16	194 55	−19 54	855
		4	9155	288 59	33 42	219 21	− 2 53	854
		5	8415	287 46	24 40	210 19	− 3 1	854
		6	4906	162 21	308 5	133 44	−17 53	859
		7	5681	160 15	303 18	128 57	−20 44	859
		8	7052	152 34	291 23	117 2	−23 2	859
		9	2354	95 45	314 58	140 37	+ 7 54	858
		4740	2932	84 4	312 58	138 37	+12 1	858
		1	4234	98 55	303 33	129 12	+ 9 43	858
		2	5286	92 19	297 35	123 14	+14 27	858
		3	9794	95 32	249 16	74 55	+18 42	864
5	309 547	4	9574	263 54	37 42	208 57	−27 1	853
		5	8448	267 44	22 28	193 43	−19 26	855
		6	9748	290 20	45 38	216 53	− 2 22	854
		7	9344	289 41	37 38	208 53	− 2 21	854
		8	7058	318 45	11 41	182 56	+20 6	857

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Nov 5		4749	6799	321 33	9 0	180 15	+21 21	857
		4750	4623	178 1	316 40	127 55	−20 54	859
		1	3797	186 15	322 11	133 26	−17 58	859
		2	7181	149 35	290 19	101 34	−21 58	859
		3	0798	18 39	329 23	140 38	+ 8 15	858
		4	1508	36 33	327 1	138 16	+12 7	858
		5	2282	82 37	317 34	128 49	+10 22	858
		6	3492	79 20	311 42	122 57	+14 51	858
		7	3566	36 20	324 5	135 20	+23 58	860
		8	4739	52 17	314 8	125 23	+28 3	860
		9	9226	121 30	262 30	73 45	− 5 46	863
		4760	9138	94. 37	263 19	74 34	+18 52	864
		1	9465	95 51	257 51	69 6	+18 1	864
9	313 622	2	7233	260 35	13 36	127 3	−20 5	859
		3	7800	266 6	20 6	133 33	−18 12	859
		4	6567	276 23	12 26	125 53	− 8 6	861
		5	7981	301 14	25 50	139 17	+ 8 44	858
		6	6782	304. 21	15 20	128 47	+10 14	858
		7	7935	320 13	23 2	136 29	+23 32	860
		8	6960	330 3	11 30	124. 57	+27 26	860
		9	5074	230 0	347 41	101 8	−23 33	862
		4770	5362	242 0	354. 21	107 48	−21 23	862
		1	2736	151 51	320 47	74. 14	− 6 43	863
		2	2949	142 11	318 11	71 38	− 5 9	863
		3	3176	49 51	324 16	77 43	+19 34	864
		4	3999	72 5	314 32	67 59	+18 7	864
		5	8997	132 10	271 24	24 51	−15 51	865
		6	9223	123 48	266 56	20 23	− 8 52	865
11	315 592	7	9895	300 55	56 49	142 19	+ 9 1	858
		8	9426	270 46	42 55	128 25	−19 2	859
		9	8006	263 37	23 27	108 57	−20 30	862
		4780	7419	259 45	17 1	102 31	−21 10	862
		1	7238	253 43	13. 19	98 49	−24 20	862
		2	2877	355 45	342 45	68 15	+17 52	864
		3	6465	141 34	299 18	25 48	−15 56	865
		4	6618	129 4	295 21	20. 51	− 8 40	865
		5	9161	135 29	271 48	357 18	−19 48	866
		6	9700	121 14	259 57	345 27	− 7 56	867
15	319 517	7	9048	318 22	41 53	71 43	+25 33	864
		8	8679	321 18	36 18	66 8	+27 10	864
		9	8103	321 33	29 42	59 32	+25 46	864
		4790	4075	240 24	354. 26	24 16	−15 50	865
		1	2918	250 0	351 44	21 34	− 8 31	865
		2	2597	224 49	345 2	14 52	−11 8	865
		3	3865	178 27	329 58	359 48	−18 14	866
		4	5113	142 58	312 34	342 24	−13 15	867
		5	4414	135 33	315 7	344. 57	− 8 5	867
		6	5509	92 45	306 48	336 38	+12 11	868
		7	9380	89 15	270 3	299 53	+21 25	869
16	320 519	8	9551	316 7	51 49	67 26	+24 45	864
		9	9074	318 36	43 9	58 46	+26 2	864
		4800	5510	256 6	7 15	22 52	−16 5	865
		1	4734	266 53	5 49	21 26	− 8 51	865

1860	Day	No	Dist	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Dec 10		4908	9352	308 37	70 38	106 26	+24 31	879
		9	8222	307 48	56 8	91 56	+20 34	883
		4910	8732	289 19	64 25	100 13	+ 6 7	880
		1	5676	333 3	27 17	63 5	+25 37	884
		2	4870	345 28	17 56	53 44	+25 13	884
		3	3738	311 41	23 15	59 3	+10 8	885
		4	3098	324 42	17 27	53 15	+11 34	885
		5	3176	173 54	358 9	33 57	−18 0	886
		6	2897	136 17	350 5	25 53	− 9 50	886
		7	4189	156 5	348 57	24 45	−20 14	886
		8	8395	63 13	314 16	350 4	+31 19	887
		9	9132	64 24	304 3	339 51	+33 2	887
		4920	8728	89 22	304 13	340 1	+10 44	889
		1	9869	94 18	283 46	319 34	+ 7 30	890
15	349 488	2	8674	260 30	67 54	32 37	−17 11	886
		3	7831	253 4	57 37	22 20	−21 17	886
		4	5819	347 54	23 48	348 31	+31 26	887
		5	5803	7 50	10 29	335 12	+34 9	887
		6	2414	340 10	16 5	340 48	+10 55	889
		7	2662	66 13	356 16	320 59	+ 7 18	890
		8	3075	233 8	21 38	346 21	−13 57	888
		9	3804	209 0	16 53	341 36	−22 5	888
		4930	3823	199 28	13 8	337 51	−23 10	888
		1	7658	69 42	323 49	288 32	+21 41	891
17	351 600	2	9723	257 13	86 59	21 44	−21 14	886
		3	6846	247 46	50 16	345 1	−21 41	888
		4	6210	241 2	43 30	338 15	−23 27	888
		5	6830	260 34	52 55	347 40	−13 21	888
		6	5947	299 23	45 39	340 24	+10 52	889
		7	3010	307 39	26 36	321 21	+ 6 58	890
		8	7169	330 3	43 22	338 7	+32 41	887
		9	7039	335 36	39 7	333 52	+34 43	887
		4940	5616	45 12	349 42	284 27	+25 27	891
18	352 504	1	8100	252 2	63 29	345 25	−21 57	888
		2	7439	246 52	53 17	335 13	−23 53	888
		3	7386	294 45	58 11	340 7	+10 56	889
		4	4829	296 15	39 39	321 35	+ 7 9	890
		5	8098	321 37	56 25	338 21	+32 31	887
		6	7880	326 57	51 32	333 28	+34 56	887
		7	4842	25 21	3 10	285 6	+25 57	891
		8	5792	124 20	340 3	261 59	−12 51	893
19	353 506	9	8711	291 25	72 34	340 17	+10 54	889
		4950	6673	290 45	54 0	321 43	+ 7 16	890
		1	3838	136 45	355 13	262 56	−15 26	893
		2	3073	116 50	356 14	263 57	− 7 16	892
		3	3814	112 33	351 28	259 11	− 7 2	892
		4	8733	320 30	64 50	332 33	+35 8	887
		5	4726	358 0	18 22	286 5	+25 59	891
		6	4215	357 11	18 2	285 45	+22 43	891
		7	9465	115 17	302 41	210 24	−16 58	895
		8	7875	78 10	323 30	231 13	+14 19	894
		9	9700	83 42	298 21	206 4	+13 19	896
20	354 500	4960	9549	289 21	85 59	339 36	+10 49	889

1860	Day	No	Dist.	Pos	Fr Node	H Long	H Lat.	Group
Dec 20		4961	8136	287° 46′	67° 47′	321° 24′	+ 7° 20′	890
		2	2456	172 14	10 15	263 52	−15 22	893
		3	3057	162 58	6 36	260 13	−17 50	893
		4	1007	167 21	12 13	265 50	− 7 10	892
		5	1887	128 54	4 55	258 32	− 7 22	892
		6	5845	67 23	342 41	236 18	+15 27	894
		7	6521	72 13	336 47	230 24	+14 40	894
		8	8908	115 4	312 10	205 47	−16 28	895
		9	8370	114 55	318 29	212 6	−15 32	895
		4970	8829	81 17	313 48	207 25	+13 18	896
		1	9475	79 56	304 26	198 3	+15 55	896
24	358 579	2	7678	257 10	67 16	263 2	−15 24	893
		3	8107	267 22	72 15	268 1	− 7 53	892
		4	9359	302 17	84 15	280 1	+24 1	891
		5	1995	187 19	18 43	214 29	−13 43	895
		6	5111	310 43	43 50	239 36	+15 2	894
		7	3911	326 11	33 9	228 55	+15 21	894
		8	6117	132 20	346 16	182 2	−23 22	897
		9	2559	17 55	15, 8	210 54	+12 9	896
		4980	3902	43 42	3 54	199 40	+15 34	896
		1	9357	85 47	309 52	145 38	+ 8 13	899
26	360 501	2	9653	259 37	95 0	263 30	−15 3	893
		3	5186	259 17	50 40	219 10	− 9 58	895
		4	8083	294 53	71 40	240 10	+14 43	894
		5	3770	167 25	13 22	181 52	−23 30	897
		6	4583	308 59	42 58	211 28	+12 39	896
		7	3705	333 31	31 41	200 11	+15 59	896
		8	5649	132 45	351 40	160 10	−22 34	898
		9	4976	127 24	354 21	162 51	−17 51	898
		4990	8209	118 44	327 7	135 37	−21 7	900
		1	6349	81 0	342 3	150 33	+ 6 33	899
		2	7042	80 31	336 51	145 21	+ 7 59	899
Jan 2 1861	1 544	3	9615	248 6	101 12	169 48	−23 1	898
		4	8977	280 21	90 20	158 56	+ 6 46	899
		5	8270	281 23	82 11	150 47	+ 6 33	899
		6	7844	284 39	77 39	146 15	+ 8 26	899
		7	6219	257 33	65 16	133 52	−10 59	901
		8	5806	254 42	61 59	130 35	−12 8	901
		9	3991	213 23	40 44	109 20	−22 52	902
		5000	3543	213 28	39 3	107 39	−20 35	902
		1	1909	326 45	33 36	102 12	+ 5 43	903
		2	3203	338 10	34 47	103 23	+13 47	903
		3	8950	108 56	324. 26	33 2	−17 23	905
		4	7746	67 23	340 7	48 43	+15 53	904
		5	8108	65 46	337 10	45 46	+18 9	904
		6	7441	56 34	346 4	54 40	+22 24	904
3	2 531	7	7946	258 29	80 42	135 18	−11 42	901
		8	7425	257 14	75 52	130 28	−12 12	901
		9	5472	238 7	57 42	112 18	−20 2	902
		5010	9334	278 56	96 32	151 8	+ 6 27	899
		1	9008	281 49	91 30	146 6	+ 8 30	899
		2	3650	295 49	47 43	102 19	+ 5 40	903
		3	7829	109 55	337 58	32 34	−17 8	905

1861	Day	No	Dist	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Jan 3		5014	6222	60 1	354 48	49 24	+15 33	904
		5	8918	68 37	328 22	22 58	+17 48	906
4	3 578	6	9326	259 17	98 21	138 6	−11 23	901
		7	8702	258 13	89 48	129 33	−12 6	901
		8	7160	245 22	73 4	112 49	−19 58	902
		9	9937	277 54	112 17	152 2	+ 7 17	899
		5020	9770	280 10	106 8	145 53	+ 9 0	899
		1	5730	285 46	63 2	102 47	+ 5 54	903
		2	4495	43 54	10 44	50 29	+15 30	904
		3	4994	48 46	6 38	46 23	+15 55	904
		4	7603	62 33	345 31	25 16	+18 3	906
		5	6204	113 3	353 0	32 45	−16 47	905
		6	8633	104 42	330 8	9 53	−14 20	907
6	5 493	7	8584	277 38	89 42	102 17	+ 5 16	903
		8	2787	147 37	22 40	35 15	−17 23	905
		9	3010	138 20	19 35	32 10	−16 46	905
		5030	5722	109 53	357 58	10 33	−14 45	907
		1	3422	336 15	39 19	51 54	+14 34	904
		2	3355	354 48	32 57	45 32	+15 42	904
		3	8945	74 43	329 41	342 16	+11 8	908
7	6 598	4	9560	275 27	104 44	101 39	+ 5 18	903
		5	2839	214 51	42 36	39 31	−17 0	905
		6	2256	188 30	34 51	31 46	−16 39	905
		7	3776	120 38	13 16	10 11	−15 8	907
		8	4498	111 30	7 26	4 21	−13 31	907
		9	6998	300 24	71 16	68 11	+18 31	904
		5040	4356	318 50	49 20	46 15	+15 46	904
		1	3590	14 2	26 53	23 48	+16 18	906
		2	7654	70 23	344 56	341 51	+11 15	908
8	7 472	3	4316	234 32	55 27	39 58	−17 28	905
		4	3160	223 14	46 52	31 23	−16 43	905
		5	8181	294 25	84 1	68 32	+18 36	904
		6	6300	297 34	67 53	52 24	+14 39	904
		7	2358	145 50	25 56	10 27	−15 22	907
		8	2839	125 0	19 58	4 29	−13 35	907
		9	6288	64 24	357 40	342 11	+11 28	908
9	8 451	5050	6089	243 41	69 58	40 35	−17 39	905
		1	4848	238 59	60 43	31 20	−17 6	905
		2	9266	290 18	99 7	69 44	+19 4	904
		3	1884	193 59	37 32	8 9	−14 26	907
		4	4606	52 34	11 56	342 33	+11 35	908
		5	5353	64 59	4 39	335 16	+ 8 24	908
		6	9444	98 16	323 29	294 6	−11 15	909
16	15 540	7	8284	281 18	95 19	325 23	+11 6	908
		8	3830	248 14	63 31	293 35	−10 32	909
		9	3106	356 41	40 55	270 59	+13 13	910
		5060	3782	33 6	27 42	257 46	+12 27	910
		1	9136	83 21	335 53	205 57	− 1 0	911
26	25 460	2	9066	261 53	116 28	205 50	− 0 39	911
		3	2522	244 26	65 56	155 18	− 9 19	914
		4	1354	187 11	54 5	143 27	−13 2	914
		5	4291	308 15	68 42	158 4	+13 13	913
		6	4018	302 45	69 6	158 28	+10 24	913

1861	Day	No	Dist.	Pos	Fr Node	H Long	H Lat.	Group
				° ′	° ′	° ′	° ′	
Jan 26		5067	8393	85 37	354 30	83 52	− 7 50	916
		8	6649	44 0	17 20	106 42	+18 16	915
		9	7575	58 6	5 52	95 14	+12 26	915
27	26 482	5070	9735	260 45	129 21	204 13	− 1 5	911
		1	4907	250 37	82 4	156 56	− 9 19	914
		2	2922	232 41	68 14	143 6	−13 13	914
		3	4994	286 29	79 22	154 14	+ 7 56	913
		4	5190	30 5	32 6	106 58	+17 47	915
		5	6813	85 7	9 45	84 37	− 8 0	916
28	27 582	6	7051	250 58	98 48	158 4	− 9 47	914
		7	7786	237 26	104 14	163 30	−20 22	912
		8	5059	241 58	83 36	142 52	−13 34	914
		9	6704	275 44	94 1	153 17	+ 6 39	913
		5080	4100	2 17	48 16	107 32	+17 18	915
		1	4894	86 7	24 37	83 53	− 8 31	916
29	28 469	2	8779	239 30	116 14	162 55	−19 35	912
		3	8344	251 13	111 34	158 15	− 9 26	914
		4	6623	245 28	96 4	142 45	−13 6	914
		5	8060	271 38	106 52	153 33	+ 6 49	913
		6	5489	301 5	79 40	126 21	+16 20	915
		7	4196	332 4	62 0	108 41	+17 47	915
		8	3464	87 28	32 49	79 30	− 8 32	916
31	30 550	9	9883	263 44	137 16	154 26	+ 4 53	913
		5090	9335	248 37	126 22	143 32	−10 43	914
		1	9572	246 7	130 43	147 53	−12 54	914
		2	5081	294 22	81 28	98 38	+12 6	915
		3	4194	303 25	74 16	91 26	+11 38	915
		4	8644	96 26	357 4	14 14	−19 5	920
		5	6919	25 22	28 31	45 41	+27 53	918
Feb 2	32 530	6	6462	349 26	57 2	46 7	+33 53	918
		7	1998	2 38	55 51	44 56	+ 4 54	919
4	34 559	8	1345	163 45	60 40	20 58	−13 58	920
7	37 592	9	9766	237 33	142 49	60 6	−18 24	917
		5100	8905	267 33	125 15	42 32	+ 8 3	919
		1	8241	271 23	117 11	34 28	+ 9 33	919
		2	7144	240 0	109 32	26 49	−15 12	920
		3	6518	242 5	104 39	21 56	−13 18	920
		4	2090	83 37	52 6	329 23	− 8 6	921
10	40 556	5	5178	250 52	98 22	333 36	− 7 14	921
		6	1929	221 50	76 41	311 55	−12 23	922
		7	6002	21 46	43 46	279 0	+22 8	923
		8	6725	25 49	37 43	272 57	+24 13	923
		9	8574	54 15	11 20	246 34	+13 6	924
		5110	9852	98 41	345 14	220 28	−25 26	927
12	42 534	1	7807	248 1	120 42	327 53	− 8 25	921
		2	5109	337 14	72 26	279 37	+23 43	923
		3	5055	353 38	63 27	270 38	+23 1	923
		4	8427	99 25	12 22	219 33	−25 34	927
		5	5881	39 7	39 12	246 23	+13 24	924
		6	7647	76 35	19 4	226 15	− 6 52	925
		7	9219	72 19	2 5	209 16	− 2 0	925
		8	8830	60 33	8 55	216 6	+ 7 53	926
		9	9166	59 54	4 40	211 51	+ 9 21	926

1861	Day	No	Dist	Pos	Fr Nodo	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Feb 17	47 494	5120	6386	282 56	108 9	244 59	+13 39	924
		1	3075	245 46	92 5	228 55	− 8 20	925
		2	1995	253 48	85 40	222 30	− 6 19	925
		3	2550	210 24	85 38	222 28	−16 23	928
		4	2080	177 7	77 30	214 20	−18 23	928
		5	3515	175 4	79 24	216 14	−26 46	927
		6	2747	324 45	78 44	215 34	+ 8 18	926
		7	0909	17 45	71 5	207 55	− 2 42	925
		8	2767	115 11	62 4	198 54	−17 42	928
		9	3633	103 40	55 24	192 14	−17 37	928
		5130	9305	93 2	4 52	141 42	−22 27	931
		1	4829	36 48	50 32	187 22	+ 9 37	929
		2	8351	60 56	18 54	155 44	+ 4 57	930
		3	9664	58 59	0 59	137 49	+10 13	930
26	56 440	4	6809	221 25	124 18	134 14	−23 43	931
		5	7671	264 47	131 6	141 2	+ 7 19	930
		6	5622	296 10	106 45	116 41	+17 46	932
		7	4777	313 35	95 55	105 51	+18 31	932
		8	7338	52 29	38 15	48 11	+ 6 58	936
		9	8582	54 37	26 14	36 10	+ 8 24	936
27	57 486	5140	8191	225 6	138 53	133 58	−23 19	931
		1	8824	261 24	144 20	139 25	+ 7 41	930
		2	7042	283 22	121 37	116 42	+17 46	932
		3	5919	294 12	110 6	105 11	+18 30	932
		4	5555	44 43	53 39	48 44	+ 6 52	936
		5	7136	49 35	41 29	36 34	+ 8 15	936
28	58 454	6	9162	225 26	152 16	133 38	−23 53	931
		7	9660	258 26	158 43	140 5	+ 7 41	930
		8	8223	276 5	134 59	116 21	+17 51	932
		9	7218	283 12	123 51	105 13	+18 43	932
		5150	4231	333 1	87 38	69 0	+17 40	933
		1	3336	106 31	69 14	50 36	−18 42	934
		2	3900	30 36	67 15	48 37	+ 6 59	936
		3	7027	27 7	50 46	32 8	+21 43	935
		4	5604	41 38	54 13	35 35	+ 8 26	936
		5	6311	46 37	49 9	30 31	+ 7 45	936
		6	9339	81 51	15 21	356 43	−15 3	937
		7	9743	84 52	6 58	348 20	−17 34	937
Mar 3	61 649	8	5050	225 14	117 37	53 40	−17 20	934
		9	9885	266 40	166 42	102 45	+17 27	932
		5160	8361	271 13	140 51	76 54	+15 12	933
		1	7776	275 30	134 3	70 6	+16 18	933
		2	3364	298 22	100 50	36 53	+ 8 2	936
		3	2897	310 5	96 13	32 16	+ 7 43	936
		4	2566	338 13	88 19	24 22	+ 7 38	936
		5	3917	15 46	74 17	10 20	+10 56	936
		6	4631	92 1	62 21	358 24	−17 25	937
		7	6267	87 43	50 23	346 26	−18 4	937
		8	7455	84 29	40 20	336 23	−17 17	937
		9	8759	87 34	26 56	322 59	−20 52	938
		5170	9249	91 9	20 5	316 8	−24 25	938
4	62 576	1	9398	266 59	156 1	78 55	+15 34	933
		2	8676	271 32	145 1	67 55	+16 45	933

1861	Day	No	Dist.	Pos.	Fr Node	H. Long	H Lat.	Group
				° ′	°	° ′	° ′	
Mar 4		5173	6803	230 5	131 59	54 53	−16 59	934
		4	4874	279 2	114 6	37 0	+ 8 14	936
		5	3262	298 46	101 13	24 7	+ 7 41	936
		6	3116	341 58	87 58	10 52	+10 51	936
		7	2906	107 16	75 56	358 50	−17 39	937
		8	4540	94. 32	64 19	347 13	−18 24	937
		9	7724	88 55	39 15	322 9	−21 4	938
7	65 490	5180	8957	259 41	154 1	35 35	+ 8 10	936
		1	7576	267 17	138 21	19 55	+10 25	936
		2	6213	274 57	126 8	7 42	+11 4	936
		3	4325	221 35	116 25	357 59	−17 8	937
		4	3174	117 19	79 55	321 29	−21 7	938
		5	8143	76 38	37 25	278 59	−12 9	940
9	67 435	6	9543	261 10	164 33	18 31	+11 40	936
		7	8923	263 59	154 35	8 33	+12 5	936
		8	7659	230 47	144 23	358 21	−16 34	937
		9	3259	197 43	107 33	321 31	−21 5	938
		5190	3309	66 14	74 56	288 54	− 6 40	940
		1	5015	82 17	64 37	278 35	−14 3	940
		2	9128	75 37	27 48	241 46	−11 14	942
10	68 450	3	8943	231 40	159 24	358 58	−16 10	937
		4	9779	259 40	171 9	10 43	+11 29	936
		5	4858	215 26	121 43	321 17	−20 45	938
		6	3138	234 42	113 27	313 1	−10 22	939
		7	0736	59 38	91 7	290 41	− 6 38	940
		8	4121	16 43	79 33	279 7	+11 19	941
		9	4811	21 27	74 53	274. 27	+13 3	941
		5200	7960	75 0	42 12	241 46	−11 18	942
11	69 492	1	9759	230 21	175 2	359 50	−16 47	937
		2	6574	221 17	136 6	320 54	−21 27	938
		3	5520	237 43	129 58	314 46	−10 30	939
		4	1911	243 2	107 25	292 13	− 7 33	940
		5	3311	335 12	96 39	281 27	+12 7	941
		6	3641	354. 58	89 26	274 14	+12 59	941
		7	6327	75 0	56 58	241 46	−11 11	942
		8	9471	90 55	24 3	208 51	−25 49	944
12	70 572	9	8177	224 40	152 11	321 40	−21 19	938
		5210	7503	238 38	146 22	315 51	−10 5	939
		1	6615	234 59	138 59	308 28	−12 28	939
		2	4598	246 31	124 52	294 21	− 5 59	940
		3	4217	297 57	112 46	282 15	+12 31	941
		4	3616	315 45	104 44	274. 13	+12 43	941
		5	8678	91 15	37 25	206 54	−25 31	944
		6	9141	84 56	30 39	200 8	−20 19	944
		7	9451	73 21	25 57	195 26	− 9 25	946
13	71 611	8	9244	225 55	166 54	321 38	−20 54	938
		9	8930	237 52	162 16	317 0	−10 7	939
		5220	8151	235 35	153 30	308 14	−12 17	939
		1	5759	242 42	133 48	288 32	− 7 29	940
		2	5796	279 47	127 51	282 35	+12 46	941
		3	4959	286 37	120 57	275 41	+12 22	941
		4	7264	94 45	53 53	208 37	−25 46	944
		5	8070	85 38	44 47	199 31	−20 16	944

1861	Day	No	Dist.	Pos	Fi Node	H Long	H Lat.	Group
				° ′	° ′	° ′	′	
Mar 13		5226	8610	77 33	38 34	193 18	−13 50	946
		7	8519	71 50	39 42	194 26	− 8 58	946
14	72 446	8	9884	225 49	182 19	325 13	−20 27	938
		9	9620	236 48	174 10	317 4	−10 17	939
		5230	7752	242 36	150 21	293 15	− 6 43	940
		1	7110	271 32	140 7	283 1	+12 49	941
		2	6252	276 42	132 29	275 23	+12 56	941
		3	6318	97 13	63 6	206 0	−25 6	944
		4	5293	5 59	82 47	225 41	+20 16	943
		5	5439	12 0	79 23	222 17	+19 11	943
		6	6936	87 28	56 15	199 9	−20 13	944
		7	7269	70 32	52 28	195 22	− 8 30	946
15	73 477	8	9078	240 22	165 56	294 12	− 7 27	940
		9	8559	241 24	159 29	287 45	− 7 1	940
		5240	8442	265 11	154 37	282 53	+12 34	941
		1	7704	267 1	147 11	275 27	+11 43	941
		2	4596	338 54	98 38	226 54	+20 8	943
		3	4658	350 31	92 58	221 14	+19 36	943
		4	4850	107 6	76 54	205 10	−25 16	944
		5	5346	93 43	70 18	198 34	−20 48	944
		6	5377	69 54	67 43	195 59	− 8 23	946
		7	5828	74 25	64 39	192 55	−11 1	946
		8	8943	76 50	36 20	164 36	−13 24	947
		9	9799	76 13	20 58	149 14	−12 1	949
18	76 446	5250	1313	229 43	110 41	196 50	− 8 53	946
		1	3057	296 49	114 15	200 24	+ 7 1	945
		2	3076	83 17	86 3	172 12	−12 12	947
		3	3881	74 50	80 35	166 44	−10 16	947
		4	4395	70 55	77 12	163 21	− 8 54	947
		5	6647	76 2	61 36	147 45	−12 35	949
		6	7217	48 16	59 23	145 32	+ 6 54	950
		7	9759	43 30	29 37	115 46	+19 2	951
21	79 448	8	7349	237 20	153 54	197 28	− 9 57	946
		9	4402	227 52	131 56	175 30	−13 26	947
		5260	3877	270 13	126 44	170 18	+ 3 11	948
		1	1050	138 5	104 37	148 11	−12 38	949
		2	2428	351 41	102 14	145 48	+ 6 30	950
		3	6918	27 19	70 49	114 23	+19 6	951
		4	8682	69 36	45 48	89 22	− 7 48	952
		5	8301	42 12	54 10	97 44	+14 2	951
		6	9344	45 24	40 27	84 1	+15 5	951
22	80 440	7	8724	237 27	168 28	197 58	− 9 25	946
		8	6312	231 56	146 26	175 56	−13 9	947
		9	5561	260 15	139 35	169 5	+ 2 55	948
		5270	2137	218 21	118 36	148 6	−12 5	949
		1	2835	300 7	116 33	146 3	+ 6 44	950
		2	5612	14 51	84 49	114 19	+18 53	951
		3	7302	68 46	60 14	89 44	− 7 51	952
		4	6825	33 48	70 4	99 34	+14 52	951
		5	8381	40 58	54 39	84 9	+15 21	951
		6	9495	58 11	36 32	66 2	+ 3 42	953
23	81 620	7	8102	232 59	162 57	175 43	−13 8	947
		8	4531	231 38	135 14	148 0	−11 46	949

1861	Day	No	Dist.	Pos	Fr Node	H Long	H Lat	Group
				° ′	° ′	° ′	° ′	
Mar 23		5279	4569	350 13	100 55	113 41	+19 13	951
		5280	5071	17 4	87 40	100 26	+15 26	951
		1	5252	69 30	76 44	89 30	− 8 31	952
		2	6931	32 56	70 43	83 29	+15 45	951
		3	8639	53 39	50 11	62 57	+ 5 38	953
24	82 424	4	6061	233 47	146 39	148 1	−11 41	949
		5	4413	328 27	112 0	113 22	+19 10	951
		6	4146	358 53	99 1	100 23	+15 23	951
		7	3565	69 59	88 21	89 46	− 8 22	952
		8	5878	24. 12	81 29	82 51	+16 10	951
		9	7317	52 27	63 37	64 59	+ 3 51	953
		5290	9671	52. 39	35 47	37 9	+ 9 20	954

SECTION III.

DISCUSSION OF THE FOREGOING OBSERVATIONS IN GROUPS, PRINCIPALLY FOR THE DETERMINATION OF THE DIURNAL MOTION IN LONGITUDE AND LATITUDE, FOR THE AFTER-DETERMINATION OF THE TRUE ROTATION OF THE SURFACE OF THE SUN AS INDICATED BY THE MEAN MOTIONS OF THE SPOTS IN CONNECTION WITH THE PROVISIONAL PERIOD OF ROTATION ASSUMED FOR THE PURPOSE OF REDUCTION

The numbers prefixed to each paragraph are those of the groups in the table of deduced positions and in the sheets of diagrams Where a group returns to view during a second or third rotation, the whole of the observations are commonly discussed together The signs prefixed to the concluded diurnal motions are such that + in longitude indicates rotation faster than 14° 11′ per diem (corresponding to the assumed period of 25 380 days), and + in latitude motion towards either Pole The three data of each line representing an observation, are—1 The time expressed in days of the year and decimals, 2 The heliographical longitude cleared of rotation at the rate of 14° 11′ per diem, and given in degrees and one place of decimals, and, 3 The latitude similarly given Notes on remarkable divergence, unusual motions, or recurrence in the same region are added where they occur, for comparison and collection afterwards

1 A single spot

	d	°	°	
at	312 5	293 9	+5 2	
	320 5	296 6	+4 6	
		Diurnal motions +21′ and −4′		for latitude +5°

2, 7, and 15 Irregular groups I deduce the following data from the diagrams

	at 324 5	254 0	+12 5	
	345 5	257 0	+10 5	
		Diurnal motions +9′ and −6′		for lat +12°
Also at	352 5	249 5	+11 0	
	377 5	251 5	+ 7 0	
		Diurnal motions +5′ and −10′		for lat +9°

6 and 14 Circular spots First observation near the limb We may replace the originals by the means

	at 342 0	345 1	−12 1	
	368 5	346 9	−12 0	
		Diurnal motions +4′ and zero		for lat −12°

10 Two dots diverging by 3 degrees per diem

11 Mere dots Compare as follows

	at 359 5	95 9	+12 2	
	362 0	96 2	+11 5	
		Diurnal motions +8′ and −16′		for lat +12°

Groups here follow which afford little or no matter for discussion, and are passed without remark

22 and 26 Exhibiting divergence in a marked degree The first line of data is formed from the mean of the observations on the 12th, 18th, and 14th, the second from those of the 16th and 18th

at 43 52	152 0	−6 8	
47 52	154 0	−7 2	
	Diurnal motions +30′ and +6′		for lat −7°

The motion in latitude is somewhat uncertain by reason of change of figure which does not equally affect the result for the longitude The two principal nuclei separate by about 80′ per diem, more rapidly than this at first, and afterwards less

25 and 31 No trace of 25 existed on March 6th, and the two dots recorded on the 9th can hardly be identified with any distinct part of the fine double group recorded on the 11th I deduce for the principal nuclei of 25

			Mean between		Dist
at 69 50	203 7	+6 8			
	197 1	+9 2	200°4	+8°0	6°6
70 52	204 6	+6 3			
	196 8	+9 2	200 7	+7 8	7 8
71 53	204 5	+6 1			
	196 5	+9 4	200 5	+7 7	8 2

then for 31 the next appearance,

	Principal Nuclei		Mean between		Dist
at 90·59	206 6	+4 8			
	198 8	+9 6	202° 7	+7° 2	9° 1
91 56	206 4	+4 5			
	198 3	+9 1	202 4	+6 8	9 4
94 55	206 0	+4 2			
	198 0	+9 0	202 0	+6 6	8 8
95 57	205 8	+4 3			
	197 8	+8 8	201 8	+6 6	9 0
97 51	205 9	+3 9			
	197 8	+9 0	201 8	+6 4	9 8

From those on the whole would result

Diurnal motions + 4′ and −2′ for lat +7°

and a divergence at last barely perceptible

27 and 34 Observed as follows

at 75 48	121 8	+17 2	and 112 3	+16 4	Dist	10 2
79 60	124 4	+17 8	111 7	+16 6		12 8
97 51	130 5	+18 8	gone			

From the two first there result means

at 75 5	117 1	+16 8	
79 6	118 1	+17 2	whence

Diurnal motions +15′ and +6′ for lat +17°

Divergence considerable, about 36′ per diem, even when the distance between the nuclei exceeds 10°

24 and 29. The single observation of 24 indicates that two nuclei broke out on March 1st, at a distance apart of 2½ degrees in the mean position 20 5 by +10 5 Omitting the observation of 29 on March 17th as too near the limb, we next find these nuclei in a mean position of 38 2 by +7 5 at a distance apart of 9 degrees on March 21st There result

Diurnal motions +35′ and −9′ for lat +9°

and a divergence of 20′ per diem on the mean of 20 days, doubtless more at first and less afterwards The observations of the circular spot 29, as under, are of no use as data for diurnal motion, the spot still retaining its divergence from its former companion

at 79 60	34 0	by +9 0
80 51	34 0	+8 9
84 57	34 3	+8 6
85 51	33 7	+8 2

32 and 38 The same small circular spot observed favourably three times in each of two rotations The observations of 32 are

			At	Means	
at 94 55	173 8	+17 8			
95 57	173 0	+18 2	95 88	173° 0	+18° 1
97 51	172 2	+18 3			

and of 38

121 57	167 4	+19 2			
123 54	167 3	+19 1	124 55	166 6	+19 3
128 55	165 1	+19 7			

Diurnal motions −13′ and +3′ for lat +19°

35 Observed twice only on April 21st and 24th

Diurnal motions zero and zero for lat −12°

30 Observed twice on the same days as 35

at 110 5	333 5	+8 4	
113 5	333 7	+8 1	

Diurnal motions +4′ and −6′ for lat +8

44 Observed three times, as follows

			Means	
at 150 52	202 4	+11 4		
	197 8	+12 1	200 1	+11 7
151 51	204 3	+11 1		
	197 3	+12 5	200 8	+11 8
154 55	206 5	+11 5		
	196 5	+12 7	201 5	+12 1

Whence diurnal motions + 18′ and +6′ for lat +12°

50 Near the position of 44 in the next rotation Observed as under

			At	Means	
at 172 59	214 1	+10 8			
173 52	214 3	+10 4	173 55	214 1	+10 5
174 53	213 9	+10 2			
at 175 54	214 1	+10 4			
176 51	214 1	+10 4	176 52	214 2	+10 4
177 52	214 3	+10 4			
at 178 53	214 5	+10 3			
179 54	215 2	+10 1	179 54	215 0	+10 2
180 56	215 2	+10 2			

Diurnal motions +9′ and −3′ for lat +10°

51 Very favourably observed, as follows

			At	Means	
at 172 59	201 7	−14 5			
173 52	202 1	−14 7	173 55	201 9	−14 7
174 53	201 8	−14 9			

			At	Means	
at 175 54	201 5	−14 9			
176 51	201 6	−14 7	176 52	201°5	−14°8
177 52	201 4	−14 7			
178 53	201 0	−14 9			
179 54	201 8	−14 4	179 54	201 1	−14 5
180 56	200 5	−14 2			
182 56	199 8	−13 7			

Diurnal motions −9′ and −3′ for lat −15°

55 All the indications of divergence and drift here exist, but the group changed too rapidly to admit of precise discussion of the positions recorded Reference must be made to the figures

57 and 59 If the influence of the dot which followed at some distance on July 29th and 30th may be disregarded, as I believe it may, there remain the following observed positions of the principal spot

at 209 565	72 2	−11 7
210 518	72 5	−11 5
212 496	72 9	−11 2
213 553	72 6	−11 1
217 587	72 4	−10 9
218 517	72 5	−10 7
219 525	71 7	−10 4

and at the next rotation—

at 236 508	74 7	−10 2
237 535	74 1	−10 3
238 564	74·3	−10 1
239 528	74 4	−10 2
240 526	74 6	−10 4
241 522	74 6	−10 4
242 546	74 7	−10 3
243 517	74 8	−10 1

From the whole may be found

Diurnal motions +5′ and −2′ for lat −11°

58 A normal single spot observed as follows

at 219 525	288 7	+6 5
221 504	288 8	+6 5
222 537	289 1	+6 4
224 525	289 3	+6 1
225 494	289 3	+6 1
227 574	289 3	+5 8

at 229 612	289 3	+5 8
230 470	289 3	+5 8
231 502	290 0	+5 8

Diurnal motions +4′ and −4′ for lat +6°

61 A single small dot seen twice only—

at 243 52	353 7	+6 0
246 52	353 6	+6 0

Diurnal motions zero and zero for lat +6°

but the dot may be the last of an unseen group

62 and 67 may be the same group, but the want of further observations of 62 prevent discussion on this supposition with safety

63 Occurs nearly in the position of 58 of the previous rotation, but the figures indicate that they are independent groups The changes of 63 are too great to admit of useful comparison Indeed, between Sep 12th and 15th, a disappearance and fresh outbreak may have occurred

64 Another group exhibiting the usual divergence, and

Diurnal motions of about +20′ and 0 for lat −8°

65 At the next rotation a dot 68 is found nearly in the same place, but without any than a chance coincidence with 65

66 Observed as follows A single normal spot

at 268 544	8 6	+10 9
269 538	8 5	+10 4
270 559	8 5	+10 4
271 554	8 6	+10 2
272 562	8 7	+10 2
273 524	8 7	+10 2
274·512	8 9	+10 5

Diurnal motions +4′ and −4′ for lat +10°

69 A single medium spot, which underwent little change

at 303 476	283 5	+7 8
304 512	283 6	+7 8
306 492	283 9	+8 1
309 520	284 3	+8 7
312 478	284 7	+9 1

Diurnal motions +8′ and +8′ for lat +8°

70, 74 and 77, appear to belong to the same group, but do not admit of numerical discussion

71 and 75, are the same group, but the "following" portion of the group is so changed in the second rotation that no deduction of motion can be made

Approximately the motions are +15′ and +2′ for lat −12°

72 Fully developed when first seen The preceding portion undergoing considerable change

73 The three first observations give—

at	326 462	342 4	+14 2
	330 494	343 0	+14 0
	332 505	343 3	+13 8

Whence diurnal motions +9′ and −4′ for lat +14°

79 An exceedingly large and fine confluent cluster, the "preceding" portion of which outlasts the rest, and comes round twice again, as 82 and 86 The two components of this group coalesced and did not diverge in the usual manner From the loss of the "following" portion, I can only indicate that both diurnal motions are positive The positions of 86 may bear comparison

80 As follows A dot, first observed very near the limb

at	17 493	302 0	+8 1
	20 567	302 2	+8 2
	22 607	303 1	+7 7

Diurnal motions +13′ and −4′ for lat +8°

83 and 87 Different, though in the same place

84 and 88 The same to be remarked, 88 not existing on March 29th, or previously Neither admit of numerical discussion

86 A small single spot observed as follows See 79 and 82

at	64 519	39 5	−9 1
	65 490	39 4	−9 0
	70 531	39 4	−9 3
	71 528	39 4	−9 3
	74 500	40 1	−9 1

Diurnal motions +2′ and +1′ for lat −9°

91 A dot observed twice on successive days.

at	108 622	297 0	+9 1
	109 512	297 2	+9 0

Diurnal motions +12′ and −6′ for lat +9°

92 A large dot with insignificant companions

at 115 506	1147	−69	
116 650	1159	−66	
117 507	1168	−66	

Diurnal motions +60′ and −9′ for lat −7°

93 A ring-formed cluster undergoing rapid change

			Means		Dist
at 121 514	825	+ 81			
	781	+ 89	803	+85	4°
122 504	839	+ 71			
	771	+ 98	805	+85	8
124 510	855	+ 65			
	775	+106	815	+85	9

From which may approximately be inferred

Diurnal motions +27′ and zero for lat +8°

95 A double dot observed twice as follows

at 121 514	281	+98	
122 504	279	+93	

Diurnal motions −12′ and −30′ for lat +10°

96 and 97 probably belong to the same group.

The following positions of 97 may be compared

			Means	
at 160 544	2693	+52		
	2648	+18	2670	+35
161 517	2704	+50		
	2646	+26	2675	+38

Also the following

164 575	2700	+46		
	2653	+50	2677	+48
166 568	2706	+43		
	2648	+51	2677	+47

On the whole diurnal motions +10′ and +4′ for lat +4°

99 May be treated as below

			Means		Dist
at 215 587	2835	+50			
	2799	+48	2817	+49	4°
216 534	2848	+55			
	2804	+43	2826	+49	48
217 645	2856	+60			
	2799	+48	2828	+54	65
218 549	2865	+61			
	2796	+49	2830	+55	7°
219 548	2865	+65			
	2793	+52	2829	+58	7°

Whence diurnal motions +17′ and +17′ for lat +5°

102 Taking means of positions observed

at 274 5	240 6	−7 9	Dist	2°3
276 5	242 0	−8 6		6 6
	Diurnal motions +36′ and +20′			for lat −8°

105 Again taking means of extreme points

at 289 542	35 5	−11 3	Dist	2 1
292 585	36 3	−11 0		5 1
	Diurnal motions +16′ and −6′			for lat −11°

107 A single normal spot favourably observed

at 296 563	238 8	+8 0
299 541	239 7	+7 4
300 539	239 9	+7 1
304 506	240 4	+7 0
	Diurnal motions +12′ and −8′	for lat +8°

113 A neat small round nuclear spot

at 100 572	162 9	−11 3
106 458	164 0	−12 4
107 507	163 9	−12 3
108 509	164 1	−12 5
109 640	164 0	−12 3
110 532	163 8	−12 3

Comparing means of two first and four last observations

Diurnal motions +5′ and +5′ for lat −12°

114 The third observation refers to part of this small group only However inferring the mean positions to be

at 109 5	72 8	+5 8
110 5	73 9	+5 8
111 5	74 4	+5 8
	Diurnal motions +48′ and zero	for lat +6°

116 First outbreak at 30 degrees South, but too fragmentary for discussion

117 A small double group of short duration

at 154 514	243 9	+10 7	Means		Dist
	240 9	+10 5	242 4	+10 6	3°0
155 513	245 7	+11 1			
	240 5	+10 3	243 1	+10 7	5 2
157 505	247 1	+11 1			
	240 1	+10 3	243 6	+10 7	7 0
	Diurnal motions +24′ and +2′				for lat +11°

121 A small nucleai spot respecting which the figures should be consulted

at 203 5	225 4	+7 2	(near the limb)
204 5	225 0	+7 1	
205 6	225 2	+7 0	
206 5	224 8	+7 1	
207 5	225 0	+7 2	
209 6	225 2	+7 3	
210 5	225 5	+7 1	
211 5	225 3	+6 7	
212 5	224 8	+6 1	(much changed)

Rejecting the first and last observation for reasons stated and grouping 2 to 5 and 6 to 8, we find

Diurnal motions +4′ and −1′ for lat +7°

123 A spot of which the following are a comparable series

at 228 505	262 0	−8 0
229 599	262 8	−7 8
233 565	263 1	−7 7
234 507	263 2	−7 5
235 512	263 3	−7 4
238 513	264 1	−7 4

Diurnal motions +10′ and −4′ for lat −8°

124 A rather low South group which must be treated as follows, rejecting the observations of Aug 30th and 31st

			Means	
at 244 58	90 8	−24 5		
	87 6	−24 6	89 2	−24 6
245 51	91 6	−24 8		
	86 9	−24 6	89 2	−24 7
246 51	92 0	−25 3		
	86 7	−24 5	89 3	−24 9
247 50	91 8	−25 2		
	86 3	−24 5	89 1	−24 9
248 51	91 7	−25 3		
	85 9	−24 5	88 8	−24 9
249 54	91 5	−25 6		
	86 7	−23 9	89 1	−24 8

Divergence very little after the two first days

Diurnal motions− 5′ and +3′ for lat −25°

125 A high North group of small extent and duration

			Means	
at 254 52	319 4	+32 5		
	316 6	+32 0	318 0	+32 2
256 61	318 9	+31 8		
	315 4	+32 0	317 2	+31 9

257 51	318 6	+31 6			
	314 6	+32 4	316 6	+32 0	
	Diurnal motions −30′ and −2′				for lat +32°

128 A sharply defined dot The first observation must be rejected as faulty in longitude, though I cannot trace any error There remain

at 303 570	9 0	−27 5			
305 535	9 2	−27 9			
307 542	7 9	−27 9			
308 511	7 5	−27 9			
	Diurnal motions − 24′ and +2′				for lat −28°

129 The changes shown in the figures are very characteristic, but too inconsecutive to admit of discussion of the motions

130 Too near the limb for comparison

132 A neat round nuclear spot observed four times

at 331 5	354 6	−35 4			
333 5	355 3	−35 6			
334 5	354 2	−35 8			
335 5	353 6	−35 9			
	Diurnal motions −50′ and +6′				for lat −36°

133 Exhibiting changes interesting to compare, but not expressible in numbers

134 The diagrams contain the first traces of the group, and show the rapid development and divergence of the first two days

at 0 478	—	—	271 3	−23 2
1 492	273 0	−21 9		
	267 1	−24 5	270 1	−23 1
2 501	274 5	−22 2		
	265 8	−25 2	270 2	−23 7
4 538	274 4	−22 3		

The conclusions are too precarious to set down

135 A double group observed three times

at 9 560	209 9	+31 2	Means		
	202 7	+31 2	206 3	+31 2	
11 456	210 4	+30 5			
	200 4	+31 9	205 4	+31 2	
13 503	209 4	+30 4			
	198 8	+31 5	204 1	+31 0	
	Whence diurnal motions −33′ and −3′				for lat +31°

137 First observation too near the limb The others give for the central point (see figures)

at 15 5	67 1	+3 0	
16 6	67 0	+3 8	
18 6	67 6	+4 5	
20 5	67 8	+4 7	
	Diurnal motions +13′ and +24′		for lat +4°

138 A single dot, accurately observed four times

at 22 538	316 2	−29 3	
23 649	316 5	−28 8	
27 481	314 6	−29 5	
28 476	314 0	−29 7	
	Diurnal motions −24′ and +7′		for lat −29°

139 Two fine spots, from 10 to 12 degrees distant, which exhibited a rapid motion in common to the two

			Means		Dist
					°
at 34 468	159 4	−31 3			
	151 8	−36 1	155 6	−33 7	9 2
36 492	159 8	−31 5			
	149 5	−36 1	154 7	−33 8	11 5
39 416	158 9	−32 0			
	147 7	−36 3	153 3	−34 2	12 0
41 489	155 7	−32 0			
	145 1	−36 1	150 4	−34 1	11 5
42 505	154 7	−32 0			
	144 4	−36 2	149 6	−34 1	11 5
43 474	154 1	−32 2			
	143 7	−36 3	148 9	−34 3	11 5
	Diurnal motions −44′ and +3′				for lat −34°

140 A sharp dot well observed four times

at 42 505	56 6	−28 0	
45 515	56 4	−27 8	
46 507	56 4	−27 9	
47 581	56 1	−27 9	
	Diurnal motions −5′ and −1′		for lat −28°

141 A small group which existed only two days

			Means	
at 63 550	212 0	−24 3		
	209 2	−24 3	210 6	−24′3
64 582	212 8	−24 2		
	208 1	−24 4	210 4	−24 3
	Diurnal motions −10′ and zero			for lat −24°.

142 A dot, which became nucleus of a penumbral spot and again on the fourth day a dot See figures

at	73 5	22 3	−29 8	
	74 5	22 9	−29 7	
	75 5	23 2	−30 1	
	76 5	22 9	−30 3	
		Diurnal motions	+14′ and +14′	for lat −30°

I suspect that on the first two days there was a sensible motion of divergence towards greater longitude, which vitiates the conclusion in this instance

143 A well defined dot seen twice only

at	89 633	263 2	+28 0	
	90 570	263 1	+28 4	
		Diurnal motions	−4′ and +24′	for lat +28°

144 We must be guided in the treatment by the figures Taking means of extreme portions,

			Means	
at 95 5	136 5	−27 7		
	126 3	−30 3	131 4	−29 0
96 6	136 9	−27 2		
	125 5	−29 7	131 2	−28 5
98 6	136 5	−27 0		
	123 4	−29 8	130 0	−28 4
99 5	136 2	−26 7		
	122 8	−30 5	129 5	−28 6
101 6	135 6	−27 2		
	121 0	−30 6	128 3	−28 9
	Diurnal motions	−30′ and 0		for lat −29°

146, 157 and 161 Supposed to be the same, and entirely independent of 144 of the previous rotation In which case an instance of one component lasting to the third rotation after the other has disappeared Observations of the first rotation—

at	121 483	122 2	−21 4	
	122 583	122 2	−21 5	
	124 590	121 7	−21 8	
	125 487	121 6	−21 7	
	126 623	121 6	−21 7	
	128 623	121 2	−21 8	
	130 483	120 2*	−21 9	(near the limb)

Observations of the second rotation

at	145 519	119 7*	−21 7	(near the limb)
	146 504	119 3	−21 4	
	147 544	119 1	−21 4	

149 511	118 9	−21 5	
151 500	118 3	−21 8	
152 672	117 6	−21 9	
153 580	117 7	−21 8	
154 505	117 1	−21 8	
155 507	116 7	−21 6	
157 658	115 1*	−21 2	(near the limb)

Observations of the third rotation

at 173 518	114 1*	−21 3	(near the limb)
174 528	112 9	−21 5	
175 529	112 5	−21 9	
176 421	112 1	−21 9	
177 645	110 9	−22 1	
178 512	110 5	−22 1	
179 667	110 1	−22 3	

On the fourth rotation of this portion of the Sun no remains of this spot are found, but on the fifth there are two new small nuclear spots (172) Reducing each series to one position at each rotation

at 125 5	121 7	−21 7
151 5	118 1	−21 7
177 5	111 2	−22 1

From the first and second there result

Diurnal motions −8′ and 0′ for lat −22°

From the second and third

Diurnal motions −14′ and +1′ for lat −22°

conclusions of considerable weight

147 and 158 Unusually slow in developing At its second appearance the indications of drift are very remarkable The following may be compared

at 132 463	30 7	−26 2	Means	
	24 4	−27 0	27 6	−26 6
135 511	30 7	−26 8		
	20 6	−29 1	25 7	−28 0
136 525	31 9	−26 8		
	19 4	−29 0	25 7	−27 9

Whence diurnal motions about −30′ and +10′ for lat −28°

In the second rotation we must infer from the figures

at 154 5	18 5	−28 2
158 5	14 3	−29 0

and diurnal motions −60′ and +12′ for lat −28°

150 A moderate double group, fully developed on the second day Divergence not very marked

at 137 525	313 5	−23 1	Means	
	310 9	−21 8	312 2	−22 4
138 593	313 4	−23 4		
	309 3	−23 2	311 4	−23 3
139 504	313 4	−23 6		
	308 9	−23 5	311 2	−23 6

Diurnal motions −30′ and +18′ for lat −23°

152 A very interesting series for inspection Perhaps the motions may be inferred from the following,

at 135 511	290 9	+22 3	Means	
	285 0	+20 6	288 0	+21 5
137 525	293 4	+22 3		
	282 5	+20 2	288 0	+21 3
139 504	293 5	+22 5		
	283 5*	+21 3*	288 5	+21 9

Motions uncertain probably positive for both elements

154 and 160 Imperfectly observed Probably different

155 Nearly on the Equator Unfortunately seen but once

159 Similar dots, but new ones, here next rotation

162 and 168 I take the nucleus which lasts through

at 186 474	60 2	+23 9	Means	
187 531	59 9	+23 7	59 9	+23 8
188 587	59 5	+23 9		
205 622	57 1	+23 8		
206 622	56 9	+24 0	57 0	+23 9

Diurnal motions −10′ and zero for lat +24°

165 A group of large dots near the Equator

at 188 587	307 5	+3 4	Means		Dist
	301 5	+2 7	304 5	+3 1	6° 0
189 493	309 1	+3 1			
	301 7	+2 8	305 4	+2 9	7 5
191 494	311 2	+2 6			
	301 6	+2 8	306 4	+2 7	9 7
192 503	312 0	+2 2			
	301 9	+3 5	307 0	+2 8	10 2

193 495	313 2	+2 2			
	303 2	+3 8	308 2	+3 0	10 2

Diurnal motions +38′ and −2′ for lat +3°

The change of position of the line joining the two extreme points observed deserves notice in this instance as well as the ordinary divergence

166 A well defined dot

at 193 5	218 9	−22 4	
194 5	218 2	−22 3	

Diurnal motions −42′ and −6′ for lat −22°

The conclusion is of little weight, the observations being made near the limb on consecutive days

167 and 171 These are probably different The only part of 167 which would correspond in longitude to 171 the next rotation was vanishing when last previously observed, and the latitudes would not be reconcilable The unbroken series of sketches of 167 shows better than usual what might be obtained in a finer climate The first trace and nearly the whole history of the group are recorded. No satisfactory discussion for diurnal motions is however possible

168 A well defined small spot seen twice only

at 205 6	57 1	+23 8	
206 6	56 9	+24 0	

Diurnal motions −12′ and +12′ for lat +24°

Of little weight for the same reason as for 166

170 An excellent series of a normal spot

at 223 660	189 9	−20 2	
224 561	189 8	−20 3	
225 581	189 2	−20 6	
227 492	188 5	−20 5	
228 449	188 6	−20 7	
229 489	188 4	−20 6	
230 528	187 9	−20 4	

Diurnal motions −16′ and +3′ for lat −20°

171 Another good series of a normal spot

at 223 660	187 7	+27 5	
224 561	187 1	+27 5	
225 581	186 5	+27 7	
227 492	185 9	+28 3	
228 449	185 4	+28 4	
229 489	185 1	+28 5	
230 528	184 4	+28 4	

Diurnal motions −25′ and +10′ for lat +28°

173 A still better series wanting only one day

at 233 501	39 2	−29 0
234 503	39 5	−28 6
235 461	38 7	−28 5
236 526	38 0	−28 7
237 511	37 6	−28 9
238 551	37 6	−29 1
239 510	36 5	−29 1
241 496	35 2	−28 6
242 500	34 4	−28 3
243 514	33 7	−28 0
244 565	33 1	−27 8

Diurnal motions $-38'$ and $-6'$ for lat $-29°$

174 and 184 I should not hesitate to identify these groups as the same, but that on Aug 31st, 174 was manifestly tending to extinction, and on Sept 1st and 2nd, the Sun was observed and no group recorded in the position of 174 184 came on on Sept 20th, as 174 was last seen on Aug 31st, having two simple centres at the same relative positions, and affected by a common motion in longitude The coincidence is peculiar, and looks like evidence of the revival of a group after an interval of several days

For 174 we have the following observations,

			Means	
at 236 5	27 4	+19 8		
	23 5*	+20 4*	25 4	+20 1
237 5	28 6	+19 5		
	23 2*	+20 5*	25 9	+20 0
238 5	29 1	+19 9		
	23 2	+20 8	26 2	+20 3
239 5	28 6	+19 8		
	22 6	+21 9	25 6	+20 8
241 5	28 8	+19 5		
	22 2*	+21 5*	25 5	+20 5
242 5	28 7	+19 5		
	21 8	+21 1	25 3	+20 3

Whence diurnal motions $-6'$ and $+1'$ for lat $+20°$

For 184 the following positions were obtained

at 262 5	25 1	+19 7		
	18 2	+21 3	21 7	+20 5
263 5	24 8	+19 2		
	18 2	+21 3	21 5	+20 3
265 5	25 2	+19 1		
	17 6	+21 8	21 4	+20 5

266 5	25 4	+19 0		
	17 6	+22 0	21 5	+20 5

Diurnal motions −4′ and 0 for lat +20°

It may be well to repeat that in the record of Sept 1st, 1857, it was expressly noted that 174 was gone

176 Two spots of short duration

			Means	
at 247 5	304 4	+29 2		
	298 1	+28 4	301 3	+28 8
248 6	304 2	+29 6		
	297 8	+28 5	301 0	+29 0
249 5	304 0	+29 5		

Diurnal motions −18′ and +10′ for lat +29°

177 Observed twice Gone on the 6th Sept 185 is near here

at 244 5	264 3	−17 2	
247 5	263 7	−17 1	

Diurnal motions −12′ and −2′ for lat −17′

178 Several small dots

			Means	
at 248 6	232 2	−20 2		
	228 6	−19 8	230 4	−20 0
249 5	233 8	−20 2		
	228 4	−19 4	231 1	−19 8
252 5	234 6	−20 0		
	228 6	−19 8	231 6	−19 9

Diurnal motions +15′ and zero for lat −20′

179 and 187 No numerical discussion of 179 is practicable On Sept 14th, it is recorded as dying away, and on the next day an outbreak is noted, which has the appearance of a new group overlying part of the old one Of 187 the following positions are found

at 274 5	211 5*	+19 0 near the limb
277 5	209 6	+19 0
278 5	209 3	+19 0
282 5	208 8	+18 8
285 5	207 8	+19 3
286 5	207 8	+19 5

Diurnal motions −12′ and +3′ for lat +19°

180 A neat circular spot favourably observed 190, which is near the same place, is different

at 252 5	176 2	−26 5
255 5	174 3	−26 9
256 5	173 5	−26 5
258 5	172 4	−26 6

259 5	171 7	−26 7
260 4	170 8	−26 7

Diurnal motions −40′ and zero for lat −27°

181 and 189 The components extend over 20 degrees For 181, while double, we have

at 252 451	177 0	+23 2	Means	
	167 3	+22 2	172 2	+22 7
255 520	178 8	+22 4		
	165 0	+24 0	171 9	+23 2
256 668	178 6	+22 7		
	163 8	+24 5	171 2	+23 6
258 496	178 2	+22 9		
	162 5	+24 5	170 4	+23 7
259 489	178 0	+22 8		
	162 5	+24 8	170 3	+23 8
260 413	177 3	+22 7		
	162 3	+24 9	169 8	+23 8

Diurnal motions −20′ and +10′ for lat +23°

For the two rotations I compare the following

at 260 4	177 3	+22 7	176 2	+22 4
262 5	175 2	+22 2		
277 5	173 6	+21 5	172 1	+21 2
278 5	173 7	+21 3		
282 5	172 2	+21 0		
285 5	170 6	+21 0		
286 5	170 3	+21 3		

Whence diurnal motions −12′ and −3′ for lat +22°

182 is different from 192 and 201, inasmuch as on Sept 23d it was no longer visible This spot shows fully the process of one round nuclear spot breaking up into two See 224 for another instance, also 219 and 290 I treat 182 as follows,

at 255 520	——	——	118 5	−17 8
256 668	——	——	118 2	−17 6
258 496	120 0	−16 9		
	117 5	−18 1	118 8	−17 5
259 489	120 2	−17 1		
	117 4	−17 8	118 8	−17 5
260 413	120 7	−16 9		
	117 3	−17 5	119 0	−17 2

After this the changes are too great

Diurnal motions +10′ and −5′ for lat −17°

183 and 194 Groups 204 and 211 are distinct, 194 having disappeared on Oct 27th The divergence of 183 during the first 7 days is extraordinary, and the instance is favourable for noticing that the separation takes place in the line joining the two spots, and is not merely a difference of motion in longitude One spot here moves North and the other South very plainly

			Means		Dist
at 266 489	36 6	+23 8			
	34 0	+24 6	35 3	+24 2	2 6
268 471	39 2	+23 6			
	30 6	+26 2	34 9	+24 9	9 0
271 458	42 7	+22 5			
	28 9	+26 9	35 8	+24 7	15 0
272 472	42 5	+22 3			
	27 6	+27 3	35 1	+24 8	16 0

I do not think any conclusion of diurnal motion would be of value For 194 we have the following

at 288 507	47 3	+25 6
289 499	46 8	+25 8
291 594	46 0	+25 9
292 568	46 2	+26 0
295 546	46 1	+26 2
296 482	46 0	+26 5
298 465	45 5	+26 8

taken alone these positions indicate

Diurnal motions $-7'$ and $+7'$ for lat $+26°$

192 and 201 Of 192 most may be learnt from the figures The observations of 201 are

at 311 564	129 4	−18 9
312 456	129 4	−18 9
314 476	128 5	−18 5
318 490	127 8	−18 5

Diurnal motions $-16'$ and $-5'$ for lat $-19°$

193 and 208 must be different, for 193 is recorded gone on Oct 24, and yet how similar in every respect Of the former we find

at 291 594	56 7	−23 0
292 568	56 6	−23 4
295 546	55 8	−23 0

Diurnal motions $-14'$ and $-3'$ for lat $-23°$

Of 208 we have

			Means	
at 318 5	54 9	−23 5		
	50 7	−23 1	52 8	−23 3

321 5	56 9	−22 4		
	48 6	−23 5	52 8	−23 0
322 6	57 6	−22 6		
	49 0*	−23 0	53 3	−22 8

The position of the mean is rendered uncertain by the degradation of one of the component spots

195 Very near the Equator, but seen only on two days

197 May be the commencement of 207, but uncertain

198 Too rapidly changed for comparison of parts

199 The principal spot subdivides into three, which on November 1st, 1857, appear in contact The interruption of the record by weather is to be regretted

at 299 5	244 0	+22 0	
300 5	242 9	+21 9	
302 5	242 0	+21 3	
304 6	240 5	+21 3	
	Diurnal motions −38′ and −12′		for lat +22°

200 Seems to admit only of the remark that the extent in longitude on November 1st was more than 30 degrees, if the two nuclei seen only on that day belong to the same group as the rest

203 See 193 Compare also 210

204 See 183 Compare also 211

207 A normal spot (see 197) observed as follows

at 322 6	311 2	−16 3	
325 6	311 1	−17 0	
328 5	310 9	−17 0	
330 5	310 4	−16 9	
331 5	310 2	−17 0	
	Diurnal motions −10′ and zero		for lat −17°

208 A neat normal spot

at 337 5	159 9	−17 1	
338 5	159 9	−16 7	
341 5	159 6	−16 7	
	Diurnal motions −5′ and −3′		for lat −17°

209 Another very similar to the last

at	337 5	149 8	+29 5
	338 5	149 3	+29 8
	341 5	147 8	+29 8

Diurnal motions −30′ and +3′ for lat +30°

210 Very imperfectly observed through bad weather I think the dots in longitude 62° in the next rotation are the remains of this group and do not belong strictly to 220

213, 214, etc to 217 Bad weather has rendered the observations too inconsecutive for discussion

218 A dot follows which renders results precarious

at	8 635	111 4	+ 6 3
	10 551	111 4	+ 7 4

Diurnal motions zero and +30′ for lat +7° (?)

219 The diagrams for January 4th, 9th, 11th and 12th, which should be referred to indicate

Diurnal motions zero and zero for lat −8°

220 and 229 The first of these should have received two numbers, as there can be little doubt of there being two groups with the remains of 210 between them on January 9th The portion B which was first seen on that day admits only of inspection The principal spot of group A recurs in 229, and the figures show that it may be treated as follows

First rotation

at	3 5	84 0	−27 6
	8 6	81 8	−28 2
	10 6	80 5	−28 3
	11 5	79 9	−28 5
	12 5	79 8	−28 8
	13 5	78 4	−28 9

Second rotation

	30 5	68 3	−29 7
	31 5	68 1	−29 4
	35 5	65 3	−28 7
	38 6	63 7	−28 6
	39 6	63 3	−28 8

The drift may best be obtained from the following means

at	11 5	80 1	−28 5
	35 5	65 6	−29 0

Whence diurnal motions −36′ and +1′ for lat −29°

Group 239 appears to be another outbreak in the same region, distinct from the foregoing

224 One of the best series obtained and highly interesting as an instance of the separation of one spot into two detached ones For motion take observations

at	18 5	——	——	225 9	+33 6
	20 5	——	——	225 1	+33 5
at	26 5	221 8	+33 3		
		219 3	+34 3	220 6	+33 8
	27 5	221 2	+33 5		
		218 4	+34 7	219 8	+34 1

Diurnal motions—42′ and +3′ for lat +34°

226 The divergence is very marked, but this group attains no development

230 A well marked dot, seen twice only

at	48 573	231 2	+20 3
	49 647	231 7	+20 3

Diurnal motions +24′ and zero for lat +20°

231 Observed as follows

at	48 6	223 7	−21 3	
		217 7	−23 1	220 7	−22 2
	49 6	223 6	−20 9	
		217 3	−23 5	220 5	−22 2
	52 6	225 0	−20 4	
		216 0	−23 9	220 5	−22 2

Diurnal motions zero and zero for lat −22°

233 A normal spot, not very favourably observed

at	49 647	171 6	−28 8
	52 558	169 2	−28 4
	58 560	164 1	−29 6

Diurnal motions −50′ and +8′ for lat −29°

235 Does not admit of numerical discussion

236 Two dots only High north

at	64 6	92 7	+36 4	
		88 9	+37 6	90 8	+37 0
	65 6	92 2	+35 6	
		86 7	+37 4	89 5	+36 5

Diurnal motions −78′ and −30 for lat +37°

238 The three observations of the nuclear spot show no motion, but I have no confidence in this result, as there are indications of this spot being only a portion of a group

239 It would be difficult to justify any particular course of treatment I therefore omit numerical discussion, and refer the reader to the figures

241 There being no remarkable divergence, I treat the principal nuclear spot alone as follows

at 62 5	21 2	+26 2	
64 6	21 2	+26 4	
65 6	20 8	+26 1	
66 6	20 4	+25 8	
68 5	19 5	+26 0	
69 5	18 7	+25 9	
70 5	17 7	+25 8	
Whence diurnal motions	−31′ and −2′		for lat +26°

242 A dot observed only twice

at 64 611	9 9*	−19 8
65 646	10 8	−19 6

* On referring to the original, I find that the observation of March 6th is not reliable, as snow was falling, and there were 16 different points on the disk to be observed Single contacts only were procured

244 and perhaps 253 One of the largest groups recorded Seen generally with the naked eye The portion of 244 in longitude 200° may have come on again as 253, but this is very uncertain For so large a group, the duration is short Not susceptible of numerical discussion

245 A double dot Seen twice only

at 73 480	265 5	+28 9	
74 590	264 7	+28 9	
Diurnal motions	−42′ and zero		for lat +29°

246 See the figures Comparing those of March 21st and 22nd there will be seen an instance of one spot losing its penumbra, and of another having penumbra on the 22nd which had none on the 21st The nuclear spot recorded on the 26th appears to be a new outbreak. I can base no numerical result on the data procured

247 Perhaps the portion which was situated in longitude 210° might be treated separately from that in longitude 200°, but the inferences would be questionable 259 of the next rotation appears to be distinct

248 A well marked dot observed as follows

at 78 5	194 4	+14 2
79 5	194 3	+13 9

80 5	194 4	+14 0	
81 5	193 7	+14 0	

Diurnal motions −9′ and zero for lat +14°

249 I compare the following

at 78 5	196 7	−31 8	Means	
	189 7	−33 9	193 2	−32 8
79 5	195 7	−31 7		
	189 3	−33 7	192 5	−32 7
80 5	196 9	−31 6		
	187 7	−33 8	192 3	−32 7
81 5	196 1	−31 6		
	185 7	−34 6	190 9	−32 1

Diurnal motions −36′ and −10′ for lat −33°

250 A very similar group (260) but quite distinct is here the next rotation

at 84 5	145 7	−18 0	Means	
	138 9	−17 4	142 3	−17 7
85 6	146 8	−17 7		
	138 3	−17 7	142 5	−17 7
86 6	147 9	−17 3		
	137 3	−17 4	142 6	−17 3
87 5	148 5	−17 3		

Diurnal motions +9′ and −12′ for lat −18°

253 See 244 Not susceptible of discussion

254 A small normal spot of short duration

at 100 5	279 3	+24 2	
101 5	278 7	+24 0	

Diurnal motions −36′ and −12′ for lat +24°

257 An insignificant group

at 108 5	228 8	−21 1	Means	
	226 1	−23 1	227 4	−22 1
109 6	230 1	−21 2		
	224 9	−23 6	227 5	−22 4
110 5	231 0	−21 2		

Diurnal motions +6′ and +18′ for lat −22°

258 Two or three small groups of dots See the figures Nothing can be made of them

260 New on April 19th (see 250)

			Means	
at 109 6	142 7	−18 7		
	139 3*	−20 9*	141 0	−19 8
110 5	143 8	−18 5		
	139 0*	−21 3	141 4	−19 9
111 5	144 2	−18 3		
	138 3	−21 8	141 3	−20 0
113 5	145 6	−18 1		
	137 5	−22 0	141 5	−20 1

Diurnal motions +6′ and +4′ for lat −20°

261 The principal spot of 269 is probably the same as the principal nucleus of 261 on April 28th The mean positions of 261 will be nearly as follows

at 111 5	84 6*	−20 0*
113 5	84 6*	−20 0*
114 5	84 9*	−20 0*
115 5	85 0*	−20 0*
117 5	85 2*	−20 0*

from which a small positive motion in longitude would follow while for 269 we have

at 140 6	73 1	−22 2
142 5	72 6	−22 2
145 6	71 6	−22 1
148 5	71 2	−22 6
149 5	71 0	−22 6

Whence diurnal motions −14′ and +3′ for lat −22°

Both results must be taken for what they are worth with others The divergence of 261 is remarkable

262 Appears to be two separate groups, the portion between longitudes 15 and 35 appearing again as 272 Discussion is quite impossible

264 The following points are comparable

			Means	
at 122 5	360 5	+26 8		
	353 9	+28 2	357 2	+27 5
124 5	359 6	+27 2		
	352 5	+28 5	356 1	+27 8
126 6	358 6	+27 6		
	351 4	+28 1	355 0	+27 9

Diurnal motions −33′ and +6′ for lat +28°

267 I suspect this is the latter portion of a group not seen. See 259 of the previous rotation

at 129 5	203 2	−20 1		
132 5	204 6	−19 5		
135 6	205 3	−19 4		
137 6	205 2	−19 4		
	Diurnal motions +15′ and −4′			for lat −20°

268 On the 26th a new outbreak occurs The previous observations are four

at 137 6	122 8	−12 4	Means	
	120 0	−11 6	121 4	−12 0
138 6	123 6	−12 4		
	119 3	−10 9	121 4	−11 7
140 6	124 6	−12 2		
	119 8	−11 5	122 2	−11 9
142 5	125 9	−11 3		
	120 1	−10 9	123 0	−11 1
	Whence diurnal motions +20′ and −6′			for lat −12°

The last observation of a new circular spot

at 145 572	128 6	−8 2

may be the same as 281 next rotation, but not certainly

270 Dots which change The following are comparable

at 148 5	45 7	−21 9	
149 5	45 8	−21 8	
	Diurnal motions +6′ and −6′		for lat −22°

271 A succession of at least 5 different outbreaks occurs in the region occupied by this group See 285, 299, 310 and 328 Not susceptible of numerical discussion

272 See the figures Refer also to 262

273 See 287 and 289, with neither of which, however, it is identical Both are fresh in the same part

275 The first trace of this large group was recorded on May 31st, when there were only 6 small dots The quantity of penumbra on most days is unusually great The motion in longitude is evidently positive, but the observations cannot be treated in any exact manner 291 may be the remainder of this group next rotation

278 Two groups under this number

A

at 156 5	208 7	+16 2		
157 5	208 4	+16 2		
158 5	208 8	+16 1		
159 5	208 8	+15 8		

Whence diurnal motions +8′ and −8′ for lat +16°

B A new group of which the divergence is noticeable

at 164 5	196 0*	+13 4*	Means	
	192 2	+13 0	194 1	+13 2
165 5	197 4	+13 9		
	191 6	+12 9	194 5	+13 4
166 5	199 2	+14 3		
	190 8	+13 1	195 0	+13 7

Whence diurnal motions +27′ and +15′ for lat +13°

281 A normal circular spot See 268 and 297

at 162 508	137 2	−9 8
163 515	137 3	−9 5
164 517	137 1	−9 5
165 519	137 1	−9 3
166 527	137 2	−9 0
169 528	137 7	−8 8
171 566	137 3	−8 9
172 535	137 2	−8 9

Diurnal motions +1′ and −4′ for lat −9°

which induces me to regard 297 as distinct

282 A small spot of very short duration

at 171 566	119 1	−20 5
172 535	118 6	−20 7

Diurnal motions −30′ and +12′ for lat −21°

284 The figures indicate the whole of this spot's brief history

at 175 666	43 9	−23 1	Means	
	41 8	−24 9	42 9	−24 0
176 547	43 9	−22 8		
	41 6	−24 9	42 7	−23·9
177 617	43 7	−22 7		
	40 6	−24 9	42 2	−23 8

Whence diurnal motions −21′ and −6′ for lat −24°

285 The second outbreak in this part See 271

at 169 5	39 4	+18 7	Means	
	32 4	+21 5	35 9	+20·1

171 6	40 1	+18 3		
	30 3	+20 7	35 2	+19 5
172 5	40 2	+18 4		
	29 8	+20 5	35 0	+19 5
173 5	40 3	+18 4		
	29 0	+20 6	35 1	+19 5

Diurnal motions −12′ and −7′ for lat +20°

287 and 289 Compare 273 of the rotation before, and 300 of the next All different

290 The lowest South spot observed by me, and I know of none other so low in the record of any other observer The spot divides into two quite detached at once

at 181 663	318 0	−45 0	Means	
	315 4	−44 8	316 7	−44 9
182 678	317 1	−44 2		
	313 9	−44 8	315 5	−44 5
184 527	314 6	−44 0		
	310 2	−44 9	312 4	−44 4

Whence diurnal motions −92′ and −8′ for lat −45°

291 A neat circular spot See 275, with which it may be connected

at 176 5	301 9*	−13 7	(near the limb)
177 6	300 7	−13 8	
179 5	300 4	−14 2	
180 6	300 5	−14 2	
181 7	300 1	−14 2	
182 7	300 2	−14 1	
184 5	300 3	−13 8	
186 5	299 8	−14 0	

Diurnal motions −4′ and −1′ for lat −14°

292 May be treated as three detached spots I extract the following only for comparison A normal spot

at 177 6	280 9	−22 0
179 5	278 5	−22 1
180 6	278 1	−21 9
181 7	277 2	−21 9
182 7	276 8	−21 8
184 5	277 0	−21 7
186 5	277 3	−21 4
188 6	276 2	−21 3

Whence diurnal motions −15′ and −4′ for lat −22°

293 Two groups under this number

A A small circular spot seen till July 6th

at 181 663	247 4	−12 3
182 678	247 4	−12 6
184 527	247 4	−12 3
186 487	247 1	−12 1

Diurnal motions −3′ and −4′ for lat −12°

B Commences as a dot on July 2nd and becomes a largish group, one component of which reappears as 304 and 316 First 293 B as follows

			Means	
at 184 527	245 3	−20 4		
	239 2	−20 2	242 3	−20 3
186 487	246 7	−20 5		
	238 3	−20 0	242 5	−20 3
188 651	246 7	−21 0		
	237 5	−22 1	242 1	−21 5

Diurnal motions −3′ and +18′ for lat −21°

Next for the nucleus which recurs

First rotation

at 188 6	246 7	−21 0
191 5	246 4	−21 3

Second rotation

at 212 5	246 2	−21 3
215 5	245 6	−21 5
218 5	243 6	−21 4

Third rotation

237 6	239 6	−21 8

The motion increases as the original divergence becomes less influential, and we may conclude

Diurnal motions −15′ and +1′ for lat −21

295 The group 306 in this region next rotation is quite distinct as the figures conclusively show. Of 295 the large spot on the parallel −21° alone admits of useful discussion

at 184 5	191 7	−20 9
186 5	190 5	−20 6
188 6	189 8	−20 8
191 5	188 7	−21 4
192 5	188 3	−21 6
194 5	187 8	−21 7
195 5	187 2	−21 6

Whence diurnal motions −23′ and +7′ for lat −21°

296 A normal circular spot

at 188 6	154 2*	−19 6
191 5	155 8	−19 5

192 5	155 0	−19 6
194 5	154 0	−19 7
195 5	153 8	−19 9
197 5	153 6	−20 1

The first of these longitudes is either in error some 3 degrees, or the spot is a component still retaining motion of divergence in a group which has disappeared

Diurnal motions −24′ and 4′ for lat −20°

297 Two groups Compare the spot in −10° with 281

A

at 188 6	140 6	− 9 9
191 5	140 3	− 9 7
192 5	140 4	− 9 9
194 5	140 7	− 9 8
195 5	140 6	−10 0
197 5	140 8	− 9 8

Whence diurnal motions +4′ and zero for lat −10°

B Hardly sufficiently observed

at 191 5	131 5	−15 5	Means	
	127 0	−16 1	129 2	−15 8
192 5	132 4	−15 8		
	127 1	−16 6	129 7	−16 2

Diurnal motions +30′ and +24′ for lat −16°

From this date the observations are less continuous from unavoidable causes

299 The third outbreak in this place See 271, 285 preceding, and 310 and 328 following I think inspection will show that any treatment by comparing means or single positions would be unsatisfactory I therefore omit discussion

305 The record exhibits very finely the first day's development of a group I take it that the component in longitude 198 is identical with 318 of the next rotation, thereby showing a motion in longitude changed from positive (due to divergence) to negative (from normal causes) The observations of 318 are two as follows

at 237 571	208 4	+13 1
247 533	206 7	+13 4

Whence diurnal motions −10′ and +2′ for lat +13°

306 The first trace is again to be seen here

at 215 5	193 8	−16 4	Means	
	189 4	−17 5	191 6	−17 0
218 5	193 8	−17 3		
	187 8	−17 5	190 8	−17 4
219 5	194 6	−17 8		
	187 5	−17 9	191 0	−17 8

Diurnal motions −9′ and +12′ for lat −17°

309 The group 327 in next rotation seems some new outgrowth of this, but cannot be identified with it

			Means	
at 230 6	55 3	−33 7		
	48 0	−35 6	51 7	−34 7
233 6	41 0	−35 3		
	54 6	−32 8	47 8	−34 1

Diurnal motions −78′ and −12′ for lat −34°

310 The observations of this and other groups following are too fragmentary to deal with

315 and 332 The principal nucleus as follows

at 237 6	271 2	−19 3
266 4	266 7	−19 5

At the first date divergence may not have wholly ceased, however

Diurnal motions −9′ and 0′ for lat −19°

319 See also 333 and 350 Record much interrupted

320, 334 and 351 appear to be the same large group, but inspection of the graphical record is all that is possible

322 and 335 may be the same, but the evidence is insufficient to proceed upon

323 and 337 are no doubt the same group

327 See remark on 309 Chief nucleus as follows

at 250 562	47 2	−34 0
254 503	43 0	−33 9
257 572	39 9	−33 6

Diurnal motions −62′ and −4′ for lat −34°

328 See 310, with the latter part of which it corresponds

334 See 319 and 350, to which I can only thus refer

336 may be the same as 321 However take only observations—

at 273 430	141 2	−25 6
275 435	140 1	−25 8

Diurnal motions −33′ and +6′ for lat −26°

341 and 357 may be compared as follows

at 289 6	348 2	+23 3
293 5	344 8	+23 7

Next rotation

at	310 5	339 3	+23 5	
	314 6	337 1	+23 3	
	315 5	336 8	+23 3	
		Diurnal motions −24′ and zero		for lat +23°

350 See 319 and 334 363 seems new

353 and 365 may be related, but are not comparable

355 A very large group, or perhaps two See 370

366 A very large spot in lat −20° covering 12 degrees of longitude without a break, which afterwards divides and diverges, so that in the next rotation its parts appear as two groups 376 and 378, separated by a clear space of more than 15 degrees Group 393 follows as a fresh outbreak in the same place

373 See 363 which precedes, and 389 which follows

374 Observed 4 times, as follows

at	352 5	164 9	−18 3	
	355 5	164 0	−18 2	
	359 6	163 3	−19 2	
	360 6	162 5	−19 3	
		Diurnal motions −15′ and +10′		for lat −19°

379 and 382 Two singular groups of dots covering 40 degrees of longitude, of which it might be wished the record was more complete

381 A large group which may have passed unseen at the next rotation between January 20th and February 3rd

386 Two if not three groups close together, which the next rotation are 399 and 401 I think the result of comparison would however be questionable

396 and 407 may I think be compared thus

at	33 5	333 9	+ 7 5		
		328 1*	+ 7 5*	331 0	+ 7 5
	61 7	344 7	+ 6 5		
		335 0	+ 7 3	339 8	+ 6 9
		Diurnal motions +19′ and −1′			for lat +7°

406 Two fair observations First nuclear, and then not

at	54 542	345 4	−17 1	
	61 678	345 2	−16 8	
		Diurnal motions −2′ and −2′		for lat −17°

408 A normal circular spot

at 61 7	289 2	+13 8	
64 5	289 3	+13 2	
66 5	288 8	+13 0	
67 5	288 1	+12 6	
68 6	288 7	+13 1	
Diurnal motions −10′ and −8′			for lat +13°

412 One component seems to lose its penumbra, and after appearing as a dot, redevelop as a penumbral spot The observations at this time were made by Mr James Breen

at 64 5	229 6	+20 0			
	223 6	+18 3	226 6	+19 2	
66 5	229 0	+19 6			
	222 7	+18 4	225 8	+19 0	
67 5	229 0	+19 7			
	222 4	+18 6	225 7	+19 2	
68 6	228 8	+19 9			
	222 4	+19 0	225 6	+19 4	
69 5	228 2	+19 7			
	221 5	+19 1	224 8	+19 4	
Diurnal motions −16′ and +4′					for lat +19°

413 to 424 The observations are either insufficient or of a kind on which no discussion for motion can be based

425 A spot which on April 1st showed penumbra

at 89 515	308 2	+19 1	
90 476	308 1	+18 8	
92 589	307 7	+18 4	
Diurnal motions −12′ and −12′			for lat +18°

433 May be the return of 423, but the record is too inconsecutive to be certain

437 A detached spot observed twice only

124 483	228 7	−16 4	
127 508	228 7	−16 3	
Diurnal motions zero and −2′			for lat −16°

439 and 455 are probably the same, but 455 consisting of two spots of which one must be new, it will be better to examine the first rotation alone

124 483	185 1	−14 1

127 508	185 1	−14 1	
131 542	185 1	−13 8	
	Diurnal motions zero and −2′		for lat −14°

The observation of the component of 455 corresponding is

155 652	184 3	−13 3	

440 A normal circular spot

at 124 5	148 6	−14 2	
127 5	148 4	−14 0	
131 5	147 8	−13 8	
	Diurnal motions −7′ and −3′		for lat −14°

442 I think the dots about it may be disregarded

at 127 5	119 9	− 6 5	
131 5	120 1	− 6 7	
	Diurnal motions +3′ and +3′		for lat −7°

444 A large double group observed twice only

at 127 5	97 6	−22 4		
	85 5	−22 2	91 5	−22 3
131 5	95 4	−22 1		
	83 4*	−23 0*	89 4	−22 6
	Diurnal motions −31′ and +4′			for lat −23°

445 and 464 There are the following observations

at 131 5	33 2	+14 9	
141 7	31 8	+15 2	
464 at 166 6	28 8	+14 8	

But the spots being merely large dots on the two last days, I think they cannot safely be combined, considering the interval of time between

453 and 478 A neat circular spot

First rotation	at 145 5	220 9	+30 6	
	155 6	214 9	+30 0	
Second rotation	173 6	209 9	+30 1	
	176 6	208 3	+29 5	
	180 5	205 7	+29 6	
	183 5	203 3	+28 6	

In this instance a normal spot of diameter less than 2 degrees preserving the same appearance throughout drifts in longitude over 17 degrees

Diurnal motions −18′ and −2′ for lat +30°

456 and 480 are somewhat similar and in nearly the same position, but the relation is doubtful

457 On the first day of observation exhibited very distinctly the deficiency of penumbra between two neighbouring nuclei, which formed one of the earliest peculiarities noticed by Dr Wilson of Glasgow The positions observed were

at 155 6	136 2	+18 1	
159 6	134 9	+17 8	(mean)
162 5	133 0	+18 0	

Diurnal motions −30′ and zero for lat +18°

There is at the next rotation a dot (481)

at 180 5	132 3	+18 7

but the identity is very questionable

459 A normal circular spot

at 155 6	99 3	−12 6
159 6	99 4	−12 7
162 5	99 5	−12 5

Diurnal motions +1′ and zero for lat −13°

465 Rather high north Normal spot

at 159 563	25 3	+37 2
162 524	22 4	+37 0

The first observation was taken near the limb, and there is no third one in the record

Diurnal motions −55′ and −4′ for lat +37°

466 A nearly normal spot

at 162 5	9 4	+13 1
166 5	10 4	+12 8

Diurnal motions +15′ and −4′ for lat +13°

470. A neat circular spot

at 173 6	306 8	−25 3
176 6	308 2	−26 0

The last observation was taken very near the limb, and as the resulting motions are contradictory, I do not put them down

471 A dot first without and then with penumbra

at 166 6	298 6	+16 0
173 6	299 8	+15 6

Diurnal motions +10′ and −3′ for lat +16°

476 Observed three times, but as one of two components disappears, no comparison of positions can be made

479 A rather large circular spot

at	176 5	180 0	−14 5	
	180 5	180 3	−14 9	
	183 5	180 1	−14 7	
		Diurnal motions zero and zero		for lat −15°

485 A normal circular spot of 2° diameter

at	183 525	58 9	+29 3	(near the limb)
	187 542	54 8	+29 2	
	188 548	54 1	+29 3	
	190 599	52 6	+29 7	
		Diurnal motions −50′ and +6′		for lat +29°

486 Another circular penumbral spot

at	187 542	27 5	+10 1	
	188 548	26 8	+10 2	
	190 599	26 2	+10 0	
	197 553	25 7	+10 9	
		Diurnal motions −8′ and +6′		for lat +10°

488 I disregard the influence of the small spots north-following

at	190 6	2 2	+13 4	
	197 6	2 2	+13 7	
		Diurnal motions zero and +3′		for lat +13°

491 The dots north-following are disregarded

at	197 6	299 9	+ 7 2	
	201 5	302 1	+ 8 3	
	204 7	304 2	+ 9 4	(near the limb)
		Diurnal motions +38′ and +20′		for lat +8°

494 Should probably be counted as two groups

A	at 201 5	257 4	− 9 3	Means	
		248 6	− 8 5	253 0	− 8 9
	204 7	258 1	− 9 6		
		249 1	− 9 0	253 6	− 9 3
		Diurnal motions +12′ and +8′			for lat −9°
B	at 197 6	247 4	−16 3	(near the limb)	
	201 5	245 8	−16 0		

204 7	244 5	−15 8	
208 6	244 0	−15 2	(near the limb)

Diurnal motions −20′ and −5′ for lat −16°

495 This large group was preceded in the former rotation by a group 476, which has a remarkable similarity to group 513 which follows in the next rotation

496, 516, and 535 The principal nucleus comes round a third time The group at first is of enormous area, some 16 by 8 degrees I compare the positions of the principal nucleus

First rotation	at 204 7	208 3	+20 8
	208 7	206 1	+21 8
Second rotation	229 5	200 5	+21 5
	232 5	200 0	+21 1
	236 5	198 3	+21 3
	239 5	197 4	+21 2
Third rotation	257 5	192 8	+21 3
	260 4	191 8	+21 8

Diurnal motions −16′ and zero for lat +21°

In which both rotations coincide

497 Following the above large group at some distance

at 208 6	182 3	+19 7
211 5	181 2	+19 6*

Diurnal motions −22′ and zero for lat +20°

500 A circular normal spot

at 208 6	142 8	− 7 7
211 5	143 0	− 8 0

Diurnal motions +4′ and +6′ for lat −8°

502 A neat elongated spot

208 6	93 1	−14 6	(near the limb)
211 5	91 8	−14 8	
215 5	92 7	−14 9	

The first observation throws doubt on the motion

503 Afterwards the enormous group 520 Compare the whirl of penumbra in each

508 One group disappears, and another breaks out I compare two positions of a dot which follows

at 222 735	298 0	+ 9 1
225 529	298 3	+ 9 5

Diurnal motions +6′ and +8′ for lat +9°

515 There is probably remaining divergence, and no means of ascertaining or avoiding its effect

518 All these spots may be treated individually

A	at	232 5	168 4	−19 3	
		236 5	167 6	−19 3	
		239 5	166 7	−19 7	
			Diurnal motions	−14′ and +3′	for lat −19°
B	at	232 5	160 1	−24 9	
		236 5	158 5	−25 2	
		239 5	156 9	−25 2	
			Diurnal motions	−28′ and +1′	for lat −25°

519 A detached spot of simple form

at	232 5	144 9	+22 6	(near the limb)
	236 5	143 4	+22 9	
	239 5	141 6	+23 2	
		Diurnal motions	−28′ and +5′	for lat +23°

520 See 503 previous The positions of the detached normal spot north-preceding may be compared

at	236 5	103 2	+28 3	
	239 5	101 5	+27 9	
	243 5	98 9	+27 8	
		Diurnal motions	−38′ and −4′	for lat +28°

The observation of this very splendid group on September 1st has had some notoriety Mr Hodgson at Highgate and I at Redhill witnessed and described a singular outbreak of light which lasted about 5 minutes, and moved sensibly over the contour of the spot, an account of which has been sufficiently published by me in the Monthly Notices of the R A Society for November, 1859, and since reprinted in the Philos Trans Vol 151, Part III, by Mr Stewart, in his Memoir on the Great Magnetic Disturbances which extended from August 28th to Sept 7th

522 and 541 are probably related, but there being but one observation of each, comparison would be too precarious to be introduced here

525 A normal spot observed twice only

at	243 5	356 9	+21 1	
	253 4	354 6	+20 1	
		Diurnal motions	−14′ and −6′	for lat +21°

526, 547, and 564 I suspect the last (564) is a third appearance of the principal nucleus of 526, but the inferred motions would be too conjectural for insertion

From 526 and 547 we have

at 253 4	349 3	−29 6
278 6	333 9	−30 4
281 5	331 4	−30 1

Whence diurnal motions −38 and +2′ for lat −30°

531 and 550 Rather too large for exact observation.

at 253 4	249 9	+ 7 1
257 5	251 3	+ 7 1
260 4	252 3	+ 7 6

Next rotation

at 278 6	256 5	+ 8 5	(near the limb)
281 5	255 8	+ 9 1	

Diurnal motions +13′ and +4′ for lat +8°

533 and 553 may be the same, but cannot safely be treated as such

537 and 556 occur in the same position in successive rotations, but there is but one observation of each

543, 560 and 583 are probably the same group

546 Seen twice only

at 278 6	343 4	−11 6
281 5	343 4	−11 6

Diurnal motions zero and zero for lat −12°

548 A dot, with an interval of 3 days

at 278 6	295 5	+28 8
281 5	298 6	+28 6

I suspect the longitude, or the identity

551 and 569 Some change of form takes place

at 281 5	226 2	+25 5*
292 5	221 5	+25 3

Second rotation

at 313 5	215 0	+26 1
316 5	213 7	+26 4

Diurnal motions −20′ and +2′ for lat +26°

553 I think the two positions may be safely compared

at 281 5	217 8	+ 6 8		
292 5	218 6	+ 6 0	(near the limb)	
	Diurnal motions +4′ and −4′			for lat +6°

554 and 571 are probably related, but the observations will not bear discussion

558 and 578 The same remark applies

560 See 543 and 583

564 See 526 Treated individually there are

at 306 5	306 8	−32 6		
313 5	300 7	−32 0	(near the limb)	
	Diurnal motions −52′ and −5′			for lat −32°

566 A small spot seen twice

at 313 5	246 0	−28 9		
316 5	243 1	−29 1		
	Diurnal motions −58′ and +4′			for lat −29°

567 Twice observed Dots following

at 313 5	242 2	− 6 8		
316 5	245 7	− 4 8		

I think divergence vitiates the result

568 Two large equal components

at 313 5	242 1	−13 5	Means		
	233 9	−15 6	238 0	−14 6	
316 5	242 4	−13 4			
	233 4	−15 4	237 9	−14 4	
	Diurnal motions −2′ and −4′				for lat −14°

573 and 592 The principal spot recurs

573	at 316 5	147 9	+26 5	
	320 5	146 4	+26 5	
	323 5	146 6	+26 7	
592	at 344 5	142 4	+25 4	
	348 5	142 0	+24 7	
	351 5	141 8	+24 3	
	Whence diurnal motions −10′ and −4′			for lat +26°

575 A small circular penumbral spot

at 316 5	120 9	−28 4	
320 5	117 8	−28 7	
323 5	116 1	−27 9	
327 5	113 6	−28 0	
	Diurnal motions −40′ and −3′		for lat −28°

577 A normal spot

at 320 5	97 1	+13 5	
323 5	96 8	+14 0	
	Diurnal motions −6′ and +10′		for lat +14°

579, 595 and 613 Three successive rotations

First rotation

at 320 5	92 3	−11 6	
323 5	93 7	−11 5	
327 5	93 1	−11 9	

Second rotation

at 344 5	94 0	−12 2	(near the limb)
348 5	94 3	−11 7	
351 5	93 4	−11 1	
355 5	92 5	−10 6	

Third rotation

at 375 5	92 0	−11 2	
380 5	92 1	−11 6	
381 5	92 4	−11 5	

The motion in longitude is first slightly positive and then negative, and we may safely conclude on the whole

Diurnal motions zero and zero for lat −12°

581 and 598 See diagrams

First rotation

at 323 5	44 0	+23 7	
327 5	43 5	+22 6	
330 5	44 7	+21 5	

Second rotation

at 348 5	46 6*	+21 6	(near the limb)
351 5	44 7	+22 1	
355 5	43 4	+22 0	
360 5	39 6*	+22 1	(near the limb)
	Diurnal motions −2′ and −1′		for lat +22°

582 A small circular spot, well defined

at	323 5	42 3	+14 0	
	327 5	42 1	+14 3	
	330 5	41 9	+14 4	
		Diurnal motions −3′ and +3′		for lat +14°

584 One of two spots disappears and the other shows signs of divergence from it, precluding results for motion

586 and 603 Probably the same, but the last observation of 586 and the first of 603 were taken when the spot was so near the limb that comparison with the only other observation obtained would yield no reliable result See 513 for great similarity in appearance

588 See 608 and 630 the last probably different

589 The figures show a very rapid disappearance of the larger component in the course of two days

594 and 612 Only one observation the first rotation When come round the second time, much diverged On January 11th the diagram indicates a second outbreak in the place of the first, and between the three positions of the remains of the first outbreak Discussion for motion seems impracticable

597 A rather large normal spot

at	348 5	69 8	−16 3	
	351 5	68 8	−15 9	
	355 5	68 3	−15 4	
		Diurnal motions −13′ and −8′		for lat −16°

599 Two groups One the remains of 583 Trace of the other recurs as 616 No conclusions can be drawn

601 A large normal spot

at	355 5	324 8	−18 9	
	360 5	321 5	−19 1	
	366 5	319 4	−18 7	(near the limb)
		Diurnal motions −29′ and −1′		for lat −19°

604 In the next rotation 627 takes this position I consider the following points comparable as under

at	1 5	242 7	−25 0	Means
		236 5	−28 3	239 6 −26 7

6 5	241 3	−23 6			
	235 1	−28 4	238 2	−26 0	
		Diurnal motions −17′ and −8′			for lat −26°

608 A small circular spot Another outbreak below, which may be the first trace of 630 Also see 588

at 1 5	204 7	+22 3		
6 5	203 4	+22 4		
	Diurnal motions −16′ and +1′			for lat +22°

611. There is a fresh outbreak (637) here the next rotation

612 See the remarks under 594

613 Two spots, one the remains of 579 and 595 the other which is near on January 16th is observed only once more and does not come round again

B	at 15 5	83 3	− 9 8	
	16 5	83 8	−10 0	
		Diurnal motions +30′ and +12′		for lat −10°

616 See the remarks under 599 and the figures

617 A rather large group in lat 20° N , of which the first trace appears to have been seen The growth and decay are both rapid It does not recur

618 A large spot generally circular The nucleus becomes double, and the changes prevent conclusions of much value The positions are

at 15 5	1 5	+ 8 0	
16 5	2 7	+ 7 4	
18 5	2 1	+ 7 5	
21 5	1 2	+ 7 3	
22 5	0 8	+ 7 5	
23 5	1 1	+ 7 7	
	Whence diurnal motions −11′ and −1′		for lat +8°

619 Another smaller circular spot, the nucleus of which also undergoes some change

at 15 5	358 5	−24 4	
16 5	358 7	−24 4	
18 5	357 5	−24 7	
21 5	356 0	−25 0	
22 5	355 4	−25 2	
23 5	355 2	−25 3	
	Diurnal motions −28′ and +7′		for lat −25°

620 A large dot observed twice only

at	21 5	344 5	+30 9	
	22 5	344 7	+30 8	
		Diurnal motions +12′ and −6′		for lat +31°

622 May, I think, be treated as under, as the dots which follow do not seem to affect the motion

at	18 5	319 4	−9 2	
	21 5	319 5	−8 5	
	22 5	320 0	−8 2	
	23 5	320 9	−7 7	
	27 5	320 9	−7 8	
		Diurnal motions +10′ and −8′		for lat −9°

627 See 604 and 650 I can only refer to the diagrams

628 Motion in longitude is positive as the figures show, but the observations are insufficient

629 The three middle observations will bear comparison

at	29 6	220 0	+5 1	Means	
		214 1	+5 9	217 0	+5 5
	31 5	221 3	+5 1		
		213 8	+5 7	217 5	+5 4
	32 5	221 7	+5 3		
		213 9	+6 3	217 8	+5 8
		Diurnal motions +16′ and +8′			for lat +6°

630 A large group of which 608 may be the first trace The diagrams can alone be referred to

632 Observed with penumbra on Feb 1st only

at	29 6	190 4	+17 9	
	31 5	191 3	+18 2	
	32 5	191 7	+18 4	
		Diurnal motions +25′ and +10′		for lat +18°

636 Groups in this locality the two next rotations

640 A group of many spots of which remains recur in 656, though not admitting of identification or discussion in any way See figures

641 Probably two groups Can do nothing with either

645 A group in rather high North latitude

			Means		
at 43 5	33 7	+33 4			
	28 6	+35 2	31 2	+34 3	
45 5	33 7	+32 4			
	25 7	+36 1	29 7	+34 2	
47 5	33 7	+32 0			
	23 5*	+37 0*	28 6	+34 5	
50 4	31 5	+32 0			
	20 0	+37 9	25 8	+34 9	

Whence diurnal motions −48′ and +7′ for lat +34°

646 and 663 687 also follows in the same locality Inspection shows that the two first have small motions, apart from divergence The following positions may be compared

			Means		
at 42 5	28 5	+14 4			
	20 5	+17 0	24 5	+15 7	
43 5	29 7	+14 2			
	19 8	+16 6	24 7	+15 4	
45 5	30 3	+13 8			
	19 8	+16 6	25 0	+15 2	
47 5	30 7	+13 6			
	20 0	+17 1	25 4	+15 3	

Diurnal motions +10′ and −5′ for lat +15°

647 Two distinct groups The only comparable points belong to the second one

at 50 4	346 1	−14 6	
52 6	346 4	−14 3	

Diurnal motions +8′ and −8′ for lat −14°

648, 670 and 692 A group which loses all but its principal spot

The positions of this nucleus were

First rotation	at 53 5	299 1	+20 2	
	54 5	299 1	+20 0	
Second	at 74 5	297 7	+20 9	
	77 6	296 4	+20 6	
	81 6	294 5	+20 0	
	83 6	294 1	+20 0	
	84 5	293 8	+20 2	
	85 5	293 1	+19 9	
Third	at 105 5	292 2	+21 3	
	106 5	292 0	+21 1	
	107 5	292 2	+21 0	
	108 5	291 9	+20 5	

By the first and second rotations

Diurnal motions −9′ and +0′ for lat +20°

By the second and third −7′ and +2′ for lat +21

649 I omit the observations of Feb 20th and 27th, for reasons which will appear on reference to the diagrams

at 52 6	246 6	−17 6	
53 5	246 8	−17 6	
54 5	246 5	−17 7	
57 5	246 6	−17 8	
59 5	245 9	−18 3	
60 6	246 2	−18 0	
61 6	245 7	−18 4	
Whence diurnal motions −6′ and +5′			for lat −18°

650 May be a part of 627 A neat normal spot

at 50 432	240 8	−24 1	(near the limb)
52 584	240 5	−24 0	
53 541	240 3	−23 9	
54 490	239 5	−24 1	
57 500	238 4	−24 3	
59 495	236 9	−25 0	
60 576	237 2	−24 5	
61 636	237 4	−24 6	
Diurnal motions −24′ and +5′			for lat −24°

651 A group nearly in the position previously occupied by 633, though apparently different The changes shown in the diagrams are the chief feature noticeable, other discussion being impracticable

652 and 654 are also groups of the same kind, the outlines and nuclei undergoing violent changes They appear to be respectively identical with 635 and 636 of the previous rotation

653 and 677 A A single spot of drawn-out form

First rotation	at 57 5	169 6	−6 8	
	59 5	169 1	−6 9	
	60 5	169 6	−6 9	
	61 6	169 1	−7 1	omit
	64 4	169 4	−6 5	
	65 5	169 6	−6 3	
	67 6	168 7	−6 5	
Second	at 83 5	172 9	−6 4	
	84 5	172 7	−6 5	
	85 5	172 9	−6 6	
	Diurnal motions +10′ and −1′			for lat −7°

655 Not susceptible of treatment See figures

656 See previous rotation A number of dots over more than 40 degrees of longitude, one or two of which only came to any size The following positions of the chief spot may be compared,

at 61 6	108 2	−15 8	
64 4	108 3	−15 0	
65 5	108 6	−14 7	
67 6	109 0	−14 7	
69 5	109 2	−14 7	
	Diurnal motions +9′ and −2		for lat −15°

658 A medium nuclear circular spot

at 64 4	76 6	+18 5	
65 5	76 6	+18 8	
67 6	76 7	+18 9	
69 5	77 0	+19 0	
72 4	76 4	+18 4	
74 5	76 1	+18 5	
	Diurnal motions −1′ and −1′		for lat +19°

659 The only comparable points are these

at 64 4	72 0	−5 5	
65 4	72 4	−5 3	
	Diurnal motions +24′ and −12′		for lat −5°

The observations of the spot seen in the position 68 4 by −3°, on March 8th and 15th, are not comparable, inasmuch as no such spot was visible on the 10th and 13th

660 Either different dots or discordant observations

661—665 These groups admit of no comment

666. Two separate outbreaks of short duration, each but once observed, which appear to correspond to groups 689 and 691 of the next rotation

667 A group seen twice on March 13 and 15 Not seen on the 18th In the next rotation, 690 occupies the same position, and in the third rotation a large group (771) succeeds There is no question that the three are successive independent formations or outbreaks in the same region This and other cases (666 immediately before is another) indicate that the source of energy which leads to the formation of a spot or group is not always exhausted on the disappearance of the group, that corresponding to the visible spot there is an invisible overhanging cloud or underlying volcano, the discharge of which rupturing or displacing the photosphere is sometimes intermittent

670 See 648 and 692

671 A plain dot observed four times

at 81 6	247 0	+5 8	
83 6	248 6	+5 7	
84 5	249 1	+5 8	
85 5	248 6	+5 2	
	Diurnal motions +30′ and −7′		for lat +6°

672 and 696 correspond in a certain degree, but the evidence of their identity is open to doubt The relative points in neither admit of discussion

673 Two groups A and B From the first I find

A	at 81 6	238 5	+13 6	
	83 6	238 0	+13 5	
	84 5	238 0	+13 1	
	85 5	238 2	+12 9	
	Whence diurnal motions −6′ and −6′			for lat +13°

B corresponds to 697, the next rotation

674 A large single spot of singular but not uncommon form, which I suspect divided in two between March 29th and April 1st The dots in the neighbourhood varied from day to day The observations, which did not admit of much precision, are as follows

at 81 6	208 6	−13 4	
83 6	208 0	−13 5	
84 5	208 5	−13 6	
85 5	208 3	−14 2	
88 6	207 7	−13 6	
91 6	207 6	−12 8	
	Diurnal motions −6′ and zero		for lat −14°

675 The first trace appears to have been caught Reference to the figures only is possible

677 A and B Respecting A, see 653 B must, I think, be regarded as a second outbreak of the same group The positions cannot be compared

678 A small circular spot, which is probably the remains of 654, though not comparable with it

at 84 5	164 3	+19 3	(near the limb)
85 5	163 8	+19 3	
88 6	162 1	+19 7	
	Diurnal motions −36′ and +8′		for lat +19°

679. The following may be compared

at 88 6	167 3	−22 5
91 6	167 9	−22 6

93 6	167 4	−22 6
94 6	167 4	−22 5

Diurnal motions −3′ and zero for lat −22°

681 Mere dots Compare the following

at 93 6	139 6	−17 3
96 6	138 5	−17 5

The identity, however, cannot be inferred, since no such spots were seen on the intermediate day

688 A single nuclear spot changes to one of three confluent spots, and then degrades to dots I think the motion may be inferred from the following

at 91 6	82 0	−4 5
93 6	82 3	−4 6
94 6	82 3	−4 2
96 6	82 6	−4 6

Diurnal motions +6′ and −3′ for lat −4°

685 corresponds to a part of 709, which see

687 Two distinct formations The second first appears as two dots on April 7th

Spot A	at 94 6	26 5	+20 0	(near the limb)
	96 6	26 8	+20 2	
	97 5	26 9	+20 3	
	99 5	26 8	+19 9	
	100 6	26 4	+19 5.	

Diurnal motions −5′ and −10′ for lat +20°

For the second, see the diagrams It is possible that the single spot in lat +15°, which remains on April 15th, may be the same as 709 B

688 Changes too much for comparison of parts

689 The same See the drawings

691 The observations of the principal spot are not so good as usual 712 follows near here

692 See 648, of which it is the third appearance

693 Seen twice only, as follows

			Means	
at 111 4	271 7	−20 1		
	268 0	−21 9	269 8	−21 0
112 6	272 1	−20 6		
	267 1	−22 2	269 6	−21 4

Diurnal motions too uncertain to enter

695 See diagrams I consider discussion impracticable

696 See 672, to which it seems to correspond

697 The portion in lat +13° appears to be a part of 673 B come on again, but the form undergoes too much change for motions to be inferred The more north spot was observed as follows

at 106 556	230 6	+19 4	
107 485	230 5	+19 2	
108 512	229 7	+19 5	
111 363	229 1	+20 0	
112 556	229 0	+20 1	
115 581	228 1	+20 6	
Diurnal motions −15′ and +7′			for lat +20°

701, 702 and 704 See 724 and 746, which seem to be successive reproductions of disturbance in the same region Of 701 I find observations

at 115 581	136 7	−12 0	
118 595	137 0	−12 1	
119 535	137 7	−12 0	
120 506	138 0	−12 5	
121 387	138 3	−12 5	
122 525	138 4	−12 7	
123 660	138 7	−12 1	
124 496	138 3	−12 2	
Diurnal motions +18′ and +4′			for lat −12°

702 Observed three times Neat circular spot

at 121 387	131 7	−22 1	
122 525	132 7	−21 3	
123 660	133 2	−21 1	
Diurnal motions +24′ and −15′			for lat −22°

Still more abnormal than the preceding

704 First trace recorded as a sprinkling of dots The group does not admit of discussion, but the diagrams, which are nearly consecutive, show that 724 the next rotation must be a fresh formation

703 Two dots lasting two days, and then gone The next rotation a dot 723 occupies almost exactly the position of one of them See 723

at 119 535	126 9	+17 0	Means		
	123 5	+17 4	125 2	+17 2	
120 506	127 0	+17 1			
	122 8	+17 5	124 9	+17 3	
Diurnal motions −18′ and +6′					for lat +17°

705 Two groups A and B See the figures Of the dot A the positions were,

at 119 535	99 6	+14 5
120 506	99 8	+13 8
121 387	100 0	+13 8

Diurnal motions +12′ and −10′ (?) for lat +14°

706 After two rotations, see 748 The diagrams show a peculiar motion of the principal nucleus under the joint actions of divergence and drift A trajectory through the projected positions is conspicuously curved The drift may be best inferred from the following observations

			Means	
at 121 4	97 4	+32 5		
	93 7	+33 6	95 5	+33 1
122 5	98 4	+32 5		
	91 3	+34 6	94 9	+33 5
123 7				
124 5				
125 5	99 8	+32 4		
	87 8	+34 7	93 8	+33 6
126 6	98 5	+33 0		
	85 3	+34 6	91 9	+33 8
127 5				

Diurnal motions −36′ and +6′ for lat +33°

Divergence the first two days =7 degrees See drawings Note also the general direction of the group

707 The divergence being visible on the face of the drawings, neither spot can be treated separately, and the changes of the principal nucleus prevent their being combined It will be noted that their divergence is sensible when these two spots are as much as 15 degrees apart The principal spot subdivides not into two but into several parts

708. A group of unusual development and permanence for its position so near the Equator It appears to me that the whole group swings round, and while both principal components approach the Equator, the one in longitude 60° to 65° approaches the quicker Compare the following—

			Means	
at 124 5	60 0*	+5 0*		
	52 6	+5 0	56 3	+5 0
125 5	61 9	+3 9		
	52 6	+4 9	57 2	+4 4
126 6	63 3	+3 5		
	52 1	+4 8	57 7	+4 2
127 5	64 1	+2 5		
	51 6	+4 3	57 9	+3 4

129 6	65 3	+2 1			
	51 4	+3 8	58 4	+2 9	

Diurnal motions +22′ and −22′ for lat +4°

This group is of unusual value for the subject

709 A and B Two distinct groups The first may correspond to 685 Whether or no, the motions are very small and not susceptible of nice determination The second B may be and probably is the same as 687 B

687 B	at 105 5	24 0	+15 4	
709 B	at 122 5	25 8	+15 9	(near the limb)
	123 7	24 9	+15 6	
	124 5	25 2	+15 4	
	125 5	24 5	+15 1	
	126 6	24 8	+15 2	
	127 5	24 8	+14 8	

It will be more secure to treat 709 B separately whence

Diurnal motions −6′ and zero for lat +15°

710, 730, 753 and 777 See also 664. Taking those observations of 710 which from the form of the spot admitted of tolerable precision, I find

	at 122 5	22 3	−11 7
	123 6	21 9	−11 5
	124 5	22 2	−11 5
	125 4	21 9	−11 7
	129 6	21 5	−11 0
	133 6	21 0	−11 5
Second rotation (730)			
	at 150 4	21 4	−12 6
	156 4	20 2	−12 5
	157 5	19 7	−12 8
	159 5	19 1	−12 8
Third rotation (753)			
	at 177 3	19 9	−12 8
	182 6	19 1	−12 3
	184 6	18 6	−12 5
	185 5	18 5	−12 4
	187 7	18 2	−12 2
Fourth rotation (777)			
	at 205 6	18 9	−11 7
	206 6	18 7	−11 5

We may take as mean positions

1st rotation	at 126 6	21 8	−11 5
2nd ,,	156 0	20 1	−12 7
3rd ,,	183 5	18 9	−12 4
4th ,,	206 0	18 8	−11 6

The motion in longitude decreases to zero and the motion in latitude changes sign We may take for combination with other results, and as of some weight the results

Diurnal motions −3′ and +2′	for lat −12°
−2′ and −1′	,, ,,
zero and −2′	,, ,,

This region seems subject to repeated disturbance

711 A fine well-developed group

			Means	
at 125 5	354 8	+23 0		
	346 7	+24 5	350 8	+23 8
126 6	355 8	+22 4		
	345 8	+24 8	350 8	+23 6
127 5	356 0	+22 5		
	344 7	+24 9	350 4	+23 7
129 6	356 6	+22 5		
	343 1	+25 1	349 8	+23 8
133 6	356 7	+22 8		
	340 9	+25 7	348 8	+24 2
135 7	355 3	+23 1		
	338 5	+25 4	346 9	+24 2

Diurnal motions −20′ and +4′ for lat +24°

712 It is difficult to say whether this is a renewal or a recurrence of 601 The positions are

of 691	at 105 5	349 3	+14 7
	106 6	348 8	+14 7
	107 5	349 1	+15 0
of 712	at 125 5	349 1	+13 8
	126 6	348 8	+13 6
	127 5	348 4	+13 5
	129 6	348 2	+13 4
	133 6	347 2	+14 2
	135 7	345 2	+13 5

Taking them together as the same spot

Diurnal motions −3′ and −3′	for lat +14°
Taking 712 alone −15′ and zero	for lat +14°

I take either result to be equally admissible

715 Groups 735 and 757 follow in the same place as successive independent formations See diagrams

			Means	
at 129 6	307 4	+13 5		
	305 2	+18 2	306 3	+15 9
133 6	309 7*	+13 0*		
	302 8	+17 1	305 2	+15 0
135 7	309 3	+13 0		
	300 5	+16 3	304 9	+14 7

Diurnal motions −14′ and −12′ for lat +15°

717 Appears to be two outbreaks in nearly the same region Of the second, I read off from the projected drawings the following mean positions

at 140 5	250 0	−25 0
141 5	251 0	−24 6
142 5	251 9	−24 5
143 5	252 9	−24 4

Diurnal motions +55′ and −12′ for lat −25°

The motion in longitude will be found very abnormal

718. See diagrams The drift appears to be again positive, though the changes in the group prevent its determination. This group dies away on May 24th, and the next rotation the same spot is found disturbed by 741, which broke out between June 14th and 18th

719 Defies discussion Changing every day

720 A well defined dot

at 140 5	169 8	+15 3
141 5	169 1	+15 2
142 5	168 6	+14 9
143 6	168 7	+15 2
144 6	168 7	+15 5

Diurnal motions −15′ and +3′ for lat +15°

721. I think the following positions of the principal spot may be compared notwithstanding the dots around

at 140 5	165 0	−22 2
142 5	164 7	−21 3
143 6	163 8	−22 1
144 6	163 5	−22 0

Diurnal motions −30′ and +7′ for lat −22°

722 A small group of dots of a binary form

			Means	
at 140 5	153 8	+19 3		
	150 4*	+20 5*	152 1	+19 9
141 5	155 6	+18 5		
	151 4	+20 5	153 5	+19 5
142 5	155 8	+17 8		
	151 7	+19 8	153 8	+18 8
143 6	156 3	+17 5		
	151 7	+20 2	154 0	+18 8

Diurnal motions +33′ and −27′ for lat +19°

The positive motion in longitude seems beyond dispute.

723 I point out one feature which occurs here, and which has occurred frequently before from time to time, the bend in the trajectory of successive positions near the limb to the left at the top of the page (coming on), and to the right at the bottom (going off) See groups 158, 161, and 291, and 58 and 139 for the opposite In the series where it appears it would indicate that the surface of the photosphere around the particular spot was sensibly depressed, as a little consideration will readily show It does not always occur and is not necessarily the result of depression, for 720 on the same page shows the same bend when well advanced on the Sun 723 does not recur, and the observations indicate a fresh formation on May 27th Compare these three—

at 142 5	126 9	+16 7
143 6	126 3	+16 5
144 6	126 2	+16 9

Whence diurnal motions −12′ and +3′ for lat +17°

724 Another group in the position of 704 preceding, but the positions of which will not bear comparison

725 A circular penumbral spot of normal form

at 143 6	106 6	+ 7 9
144 6	107 4	+ 8 2
147 5	108 0	+ 7 7
150 4	108 3	+ 7 8

Diurnal motions +14′ and −4′ for lat +8°

726 A spot of large area, but short duration No trace of it the next rotation Too indefinite in form for accurate discussion

728 A neat circular spot in 30° S, seen but twice

at 147 5	63 6	−30 0
150 4	62 4	−30 7

Diurnal motions −24′ and +15′ for lat −30°.

730 Consists of two The chief spot in lat −12° has been already discussed under 710 The other part is fresh and an independent form, which seems repeated the next rotation in 753

731 A group, the changes in which are well shown by the drawings, but which cannot be further treated

733 A small group of which the following may be taken

at	157 5	326 9	+16 6
	159 5	326 0	+16 6
	161 7	326 0	+16 6
	162 6	325 4	+16 4
	165 4	325 2	+16 5

Diurnal motions −13′ and −2′ for lat +17°

735 See 715 and 757, of which it appears to be an intermediate formation Also see diagrams

736 A neat circular spot as follows

at	157 5	294 9	−17 6
	159 5	296 6	−17 7
	161 7	297 6	−18 0
	162 6	297 7	−18 3

Diurnal motions +34′ and +9′ for lat −18°

But I suspect the influence of divergence is sensible

738 See the kind of divergence here shown The two nuclei on the right separate very little, while they jointly diverge from the component on the left

739 Penumbra in both spots thrown outside

at 165 4	224 4	−16 1	Means	
	220 3	−16 0	222 4	−16 1
169 6	226 1	−15 7		
	219 7	−16 6	222 9	−16 2

Diurnal motions +8′ and +1′ for lat −16°.

741 See 718, of which it seems a repetition

742 Appears to have been three small separate outbreaks, of which nothing more can be made

745 Seems to be properly two groups, if not three None are susceptible of arithmetic discussion 722 seems a precursor of part of this group.

746 Should manifestly be entered as two groups Notice the mutual repulsion between the "following" component of the "preceding" group, and the "preceding" component of the "following" group Under the peculiar circumstances I do not attempt to deduce motion

747 A circular penumbral spot

at	1735	978	+119	
	1766	998	+115	
	1773	1003	+115	
		Diurnal motions +36′ and −6′		for lat +12°

748 Observed as follows

at	1735	963	+308	
	1766	962	+309	
	1773	958	+313	
	1826	910	+319	(near the limb)
		Diurnal motions −30′ and +10′		for lat +31°

749 Two outbreaks as the diagrams show, the second being probably the commencement of 773 Of the first I find the positions

at	1735	773	−150	
	1766	769	−155	
	1773	771	−153	
		Diurnal motions −3′ and +5′		for lat −15°

750 The want of observations between the second and third obtained renders it impossible to treat this group with security

751 and 775 The principal nucleus recurs In other respects the diagrams must be referred to

at	182576	444	+117
	184563	437	+117
	185530	429	+118

Second rotation

at	203490	434	+108
	205629	429	+110
	206641	429	+110
	211545	428	+113
	213664	425	+115

Whence, assuming the identity as reliable,

Diurnal motions −2′ and −2′ for lat +11°

752 and 776 Group 799 seems by the drawing of Aug 17th to be a fresh outbreak

of the same The nucleus in longitude 45° of 752 seems to recur as the principal spot of 776, in which case the following positions are comparable

752	at 184 6	45 7	+22 2	
	185 5	45 3	+22 5	
776	at 203 5	39 6	+23 7	
	205 6	38 3	+24 2	
	Whence diurnal motions −20′ and +5′			for lat +23°

753 See 710 and 730 The motion of the spot in lat −12° has been discussed under 710 The spot in long 28° and lat −16° seems to be a fresh outbreak of that part of 710 and may even be repeated in 777 in long 33° See 777

754 and 779 This enormous group has large negative motion in longitude, and I think that the principal nucleus of 754, which about July 3rd was in longitude 359° is comparable with 779, which at July 31st is in 347° but the changes of form during the first rotation are so great, that it will be more satisfactory to treat 779 by itself as follows

at 206 6	350 4	+26 1	
211 5	347 4	+26 1	
213 7	346 9	+26 3	
216 5	344 9	+26 5	
217 6	344 3	+25 9	
Whence diurnal motions −30 and +1′			for lat +26°

755 Two groups Of the first, the following

at 184 6	354 0	+7 8	Means		
	348 7	+7 7	351 3	+7 7	
185 5	355 3	+7 7			
	347 8	+7 5	351 5	+7 6	
	Diurnal motions +12′ and −6′				for lat +8°

Of the second there are four comparable places

at 182 6	343 3	+12 4	Means		
	334 9	+14 4	339 1	+13 4	
184 6	342 5	+11 9			
	334 9	+13 7	338 7	+12 8	
185 5	342 7	+12 1			
	334 4	+14 1	338 6	+13 1	
187 7	343 1	+12 7			
	334 6	+13 9	338 8	+13 3	
	Diurnal motions −4′ and +2′				for lat +13°

756 See 780, the next rotation

757 See 715 and 735 I take the following

at	182 6	311 4	+16 4	
	184 6	309 9	+15 9	
	185 5	309 7	+16 1	
	187 7	309 3	+16 4	
	189 6	309 1	+16 4	
	190 5	308 3	+16 5	
	Whence diurnal motions		−17′ and +3′	for lat +16°

758 A moderate sized spot with 2, 8, and 4 nuclei

at	182 6	312 1	−16 9	
	184 6	310 3	−17 1	
	185 5	309 4	−17 4	
	187 7	309 1	−17 2	
	189 6	308 5	−17 2	
	190 5	308 1	−17 2	
	192 6	308 2	−17 6	
	Diurnal motions		−21′ and +2′	for lat −17°

760 A fine single nuclear spot Dots around it

at	185 5	265 8	−22 2	
	187 7	265 1	−22 2	
	189 6	265 1	−22 2	
	190 5	264 5	−22 5	
	192 6	263 8	−22 5	
	193 7	263 6	−22 5	
	194 5	262 8	−22 6	
	Diurnal motions		−20′ and +2′	for lat −22°

761 The portions of this group developed on July 8th show its real extent, and explain the after motion of the principal nucleus, which is then seen to be vitiated by divergence See figures

762 and 789 Seen on the Sun as the principal spot on the day of the eclipse, which was total in Spain on the 18th of July

First rotation 762

at	190 5	190 7	+19 3	
	192 6	188 9	+19 1	
	193 7	189 2	+19 2	
	194 5	188 6	+18 9	
	198 6	187 0	+19 3	
	199 6	187 1	+19 5	
	200 5	186 2*	+19 8*	
	201 6	185 8	+19 9	
	203 5	185 2	+20 0	(near limb)

Second rotation 789

at	219 6	183 8	+19 2
	221 5	183 6	+19 4
	222 6	182 8	+19 5
	223 5	183 0	+19 5
	226 5	182 4	+19 1
	229 5	181 8	+19 0

The motions vary, and in latitude change sign, during

First rotation	Diurnal motions −24′ and +4′	for lat +19°
Second rotation	,, ,, −12′ and −3′	,, ,,

By comparison of mean places in the two rotations,

Diurnal motions result of −11′ and zero

which is preferable as a conclusion

764 Motion in longitude evidently positive, but the interruption of the observations precludes any numerical conclusions See diagrams

765 Seen twice only

at 200 5	150 9	−10 3	Means	
	147 5	−10 1	149 2	−10 2
201 6	152 0	−10 6		
	147 7	−10 1	149 8	−10 3

Diurnal motions +33′ and +6′ for lat −10°

767 Not capable of treatment See diagrams

768 Two separate outbreaks near together

at	199 6	119 9	+ 9 6
	200 5	—	—
	201 6	—	—
	203 5	125 9	+ 9 2
	205 6	125 7	+ 9 5
	206 6	125 8	+10 0

Diurnal motions zero and +12′ for lat +10°

769 Probably a portion of 746 returned

at	198 6	115 7	−17 9
	199 6	116 0	−17 9
	200 5	115 3	−17 8
	201 6	115 1	−17 8
	203 5	115 1	−17 8
	205 6	114 8	−17 8
	206 6	114 5	−17 8

Diurnal motions −8′ and zero for lat −18°

770 The nucleus was double throughout, and the last observation indicated an approaching separation

at	198 6	110 3	+17 2
	199 6	110 5	+17 3
	200 5	109 8	+17 1
	201 6	109 7	+17 0
	203 5	109 3	+17 0
	205 6	109 2	+16 9
	206 6	109 1	+16 8

The position of the principal or South nucleus was observed
Diurnal motions −10′ and −3′ for lat +17°

771 It were to be wished that the observation on the 23d had been obtained, though there appears no doubt of the following being comparable

at	203 5	100 1	−34 0
	205 6	102 6	−33 6
	206 6	103 2	−33 4

Whence diurnal motions +57′ and −12′ for lat −34°

It is possible that this large positive motion may be caused by divergence for on July 22nd the drawing shows three dots close together, and on the 24th one is first traced at a distance of about 8 degrees The motion in longitude would appear to be exceptional in any case

772 Two dots on the 22nd, which the position of one on the 24th indicates had a mutual action on one another Accordingly not comparable

773 See 749 and 796, and the diagrams given Such groups as these require the application of photography in a climate where a continuous series of pictures can be obtained with certainty The eye and hand can only indicate the sort of changes which might be so registered

775 See 751

776 The portion in lat +24° is treated under 752 The portion in lat +20° is a new addition too near the former, and too little observed to be dwelt upon further

777 See 753 The two principal spots may be discussed separately

A	at	203 5	34 1	−15 7
		205 6	33 0	−15 7
		206 6	33 3	−15 7
		211 5	33 5	−14 8
		213 7	33 5	−14 4

Diurnal motions zero and −10′ for lat −15°

B	at 205 6	22 6	−16 9	
	206 6	23 0	−17 4	
	211 5	22 6	−17 5	
	213 7	22 2	−17 0	
		Diurnal motions	−4′ and +1′	for lat −17°

778 The break in the record is again very prejudicial I think it best to take the observations two and two

	at 205 6	5 6	+ 5 1	
	206 6	7 0	+ 5 5	
	Indicating diurnal motions		+8′ and +24′	for lat +5°

Next as a double group

at 211 5	9 5	+ 5 9	Means		
	2 2	+ 6 3	5 8	+ 6 1	
213 7	10 0	+ 6 0			
	3 0*	+ 6 4*	6 5	+ 6 2	
	Whence diurnal motions		+20′ and + 3′		for lat +6°
	Take as result		+30′ and +10′		for lat +6°

779 See 754 and 803

781 The portion in +15° had apparently begun to break up when first seen I should have expected the principal nucleus in long 328° to have come on again, but it does not, and therefore I do not work out its apparent motion The following spot, normal in form, though near, seems quite independent of the main group

at 211 5	307 1	+ 9 7	
213 7	307 7	+10 1	
216 5	307 7	+ 9 9	
217 6	308 3	+ 9 6	
219 6	308 4	+10 1	
	Diurnal motions	+8′ and zero	for lat +10°

783, 785 and 786, are sufficiently near to one another to throw doubt on any deduced motions 783 might be supposed to correspond to 807, but I think it safer to take that spot by itself The great group 785 returns as 809 much diminished, but during its second rotation again increases to be a very considerable area of disturbance 786 recurs as 813, and the principal nuclei may be compared It will be noticed that 813 exhibits a fresh formation in the course of its progress

787 I assume that the small spot following may be neglected

at 219 6	214 4	+ 7 7
221 5	214 6	+ 7 8
222 6	214 3	+ 7 8

223 5	214 1	+ 7 8	
226 5	214 1	+ 7 9	
	Diurnal motions −5′ and +2′		for lat +8°

788 One-half of this group is defective and the motion cannot be deduced in consequence

789 See 762, of which it is the second appearance

790 Disappeared before it had half crossed the disk

at 219 6	176 9	−26 2	
221 5	175 2	−26 4	
222 6	174 8	−26 5	
223 5	174 4	−26 5	
	Diurnal motions −30′ and +4′		for lat −26°

792, 815 and 839 During the first rotation, I treat this, a double group, as follows

			Means	
at 221 5	162 3	+17 2		
	152 9	+14 1	157 6	+15 6
222 6	162 4	+16 8		
	152 7	+14 2	157 6	+15 5
223 5	163 0	+17 1		
	153 0	+14 0	158 0	+15 6
226 5	163 1	+16 9		
	152 1	+14 0	157 6	+15 5
229 5	162 7	+16 5		
	151 0	+14 3	156 8	+15 4
	Whence diurnal motions −6′ and −1′			for lat +16°

Next compare the positions of the spot which recurs

First rotation, 792			
at 226 5	152 1	+14 0	
229 5	151 0	+14 3	
232 5	150 5	+14 6	
Second rotation, 815			
at 248 5	150 0	+15 2	
250 6	149 1	+14 9	
254 4	149 0	+14 9	
255 4	148 1	+14 8	
256 5	148 0	+14 9	
257 4	148 4	+14 6	
258 5	148 0	+15 2	
Third rotation, 839			
at 276 5	149 3	+15 0	(omit)
277 5	147 9	+14 9	

279 5	147 4	+14 9
281 4	146 8	+14 7
282 6	146 3	+14 7

Replacing these series by the following means, we have

at 229 5	151 2	+14 3
254 5	148 7	+14 9
280 2	147 1	+14 8

From the first and second rotation

Diurnal motions $-6'$ and $+1'$ for lat $+15°$

From the second and third rotation

Diurnal motions $-4'$ and zero for lat $+15°$

We may take for the whole, as of great weight,

Diurnal motions $-5'$ and zero for lat $+15°$

793 Compare the following positions

at 223 5	137 7	−23 2
226 5	137 0	−23 1
229 5	136 3	−23 4

Diurnal motions $-14'$ and $+2'$ for lat $-23°$

796 Probably the remains of 773 The three places may be compared as follows

at 229 5	64 8	−19 6
232 5	64 6	−19 4
233 5	64 8	−19 3

It is doubtful, from the subdividing of the nucleus, whether the observations relate to the same point

797 Five comparable observations Rapid motion

at 229 5	67 4	+31 4	
232 5	64 6	+31 7	
233 5	63 8	+31 3	
238 5	60 1	+31 2	
239 5	60 2	+31 2	(near the limb)

Diurnal motions $-50'$ and $-4'$ for lat $+31°$

799 See 752, under which I am inclined to think the following should be included as a third appearance

at 229 5	37 6	+24 3
232 5	37 5	+24 5
233 5	37 4	+24 5
238 5	36 8	+24 7
239 5	37 0	+24 7
240 6	37 2	+24 6

Whence diurnal motions $-4'$ and $+2'$ for lat $+25°$

The diagrams show two fresh formations during this rotation in long $47°$ by $+20°$

800 and 823 are hardly the same, but must belong to the same group The only comparable positions belong to 823

at	257 4	37 9	−33 6
	258 5	35 9	−33 7

The first of these is too near the limb for accuracy, and the motion is exaggerated and worthless

803 See 754 and 779, and in the next rotation 828

First take 803 by itself

at	238 5	334 1	+27 9	
	239 5	333 3	+28 0	
	240 6	332 7	+28 1	
	241 6	332 0	+27 7	
	242 7	331 5	+27 4	
	243 5	331 5	+27 2	
	244 6	330 6	+27 6	
	245 4	330 2	+27 2	
	246 5	329 8	+27 4	(near the limb)

Whence diurnal motions −31′ and −4′ for lat +28°

The observations of 828 are but two comparable

at	264 5	327 2	+26 4
	267 4	326 1	+27 6
and perhaps	273 4	323 3	+26 4

The following will be the approximate mean positions in the successive rotations

First rotation	at 184 5	359 5	+27 0
Second ,,	212 5	347 2	+26 2
Third ,,	240 5	332 7	+28 0
Fourth ,,	268 5	325 5	+26 6

The extremes of which show a retrograde motion of 34 degrees in 84 days, or a rate of −24′ per day in longitude throughout, which was less at first in consequence of divergence The actual motion is probably very accurately deduced from the second and third rotations, and may be taken to have been

−30′ and 2210′ for lat +27′

807 See 783 The series is all but perfect

at	239 5	263 6	−18 6	(near the limb)
	240 6	263 1	−18 7	
	241 6	262 9	−18 7	
	242 7	262 9	−18 5	
	243 5	263 0	−18 5	
	244 6	262 7	−18 3	

245 4	262 5	−18 4
246 5	262 3	−18 4
247 5	262 0	−18 2
248 5	261 7	−18 3
250 6	261 4	−18 4

The form of the spot may be considered as normal throughout

Diurnal motions −10′ and −3′ for lat −18°

808 A neat detached normal spot

at 240 6	253 1	+14 8	(near the limb)
241 6	253 3	+14 8	
242 7	253 4	+15 0	
243 5	253 8	+14 9	
244 6	254 1	+15 1	
245 4	254 4	+15 0	
246 5	254 6	+14 8	

Diurnal motions +20′ and +2′ for lat +15°

809 The second appearance of 785 See 835 and 853 The area disturbed was again very extensive

810 The diagrams indicate a variable motion in longitude Numerical treatment is not possible

811 and 834 must, I think, be the same spot During the first rotation the divergence is large and the motion deceptive When the companion has fairly disappeared the normal motion is shown A curved trajectory is the result

811	at 245 4	226 4	−11 1	
	246 5	227 9	−10 7	
	247 5	228 7	−10 7	
	248 5	229 2	−10 8	
	250 6	229 1	−10 4	
834	at 273 4	233 2	−11 8	
	275 4	232 7	−11 5	
	276 5	233 1	−11 8	
	277 5	232 5	−11 9	
	279 5	232 3	−12 4	

I conclude diurnal motions −10′ and +6′ for lat −12°

812 A well defined dot.

at 243 5	223 1	−3 7	
244 6	223 2	−3 3	
245 4	223 2	−3 4	

Diurnal motions zero and −8′ for lat −3°

818 I first write down four observations of 786, which it must be remembered are probably affected by irregular action of the neighbouring group

786	at 221 5	227 6	−22 7	
	222 6	227 2	−22 8	
	223 5	226 5	−22 5	
	226 5	224 1	−22 3	

Then 813 the next rotation alone

at 243 5	221 8	−22 6	
244 6	221 1	−22 3	
245 4	220 3	−22 4	
246 5	219 3	−22 2	
247 5	219 1	−21 8	
	Diurnal motions	−18′ and −1′	for lat −22°
by both rotations	By the second	−40′ and −9′	,, ,,

814 A neat circular normal spot

at 246 5	172 2	+14 4	(near the limb)
247 5	172 2	+14 3	
248 5	172 7	+14 3	
250 6	172 4	+14 4	
254 4	173 1	+15 5	
255 4	173 3	+14 9	
256 5	173 5	+15 0	
257 4	173 9	+14 9	
258 5	173 0	+15 3	(near the limb)
	Diurnal motions	+8′ and +7′	for lat +15°

815 is treated under 792 See also 839

816 and 840 may be compared throughout

Of 816 we have

at 254 4	134 2	+22 8
255 4	133 5	+22 9
256 5	133 3	+22 8
257 4	133 6	+22 6
258 5	132 9	+22 8

and of 840 the following

at 276 5	134 6	+22 2	(near the limb)
277 5	130 1	+21 8	
279 5	129 8	+21 4	
281 5	129 4	+21 2	
282 6	128 9	+21 4	

285 5	128 0	+21 6
287 6	127 4	+21 9
289 7	126 5	+22 1

By comparison of the two rotations result

Diurnal motions −11′ and −3′ for lat +22°

By the second alone I find

Diurnal motions −16′ and +3′ for lat +22°

And I conclude we must take as final the values −14′ and zero

817 A small group, which we must treat as follows

at 255 4	116 4	+10 4	Means	
	114 0*	+ 9 8*	115 2	+10 1
256 5	117 0	+10 8		
	113 6*	+ 9 6*	115 3	+10 2
257 4	118 0	+10 8		
	113 1	+ 9 6	115 5	+10 2

Diurnal motions +9′ and +3′ for lat +10°

818 A dot The first observation seems to belong to a different one in same latitude See figures

at 254 4	91 7	+12 1	(omit)
255 4	90 1	+12 5	
256 5	91 4	+12 6	
257 4	92 7	+12 5	
258 5	93 1	+12 6	

Taking the last four observations as of the same point

Diurnal motions +36′ and zero for lat +12°

821 The two observations are at too great an interval of time to be safely compared

822 The same difficulty occurs again here

823 See 800

825 Two observations, admitting of precision

at 264 5	24 2	+27 1
267 4	23 5	+27 8

Diurnal motions −14′ and +14′ for lat +27°

827 Also two observations only.

at 264 5	346 5	−12 3
267 4	346 5	−11 7

Diurnal motions zero and −12′ for lat −12°

828 See 803

829 The spot seems to have been ill-defined at the second observation

at 264 5	324 2	−20 9	
267 4	322 6	−21 6	
	Diurnal motions −34′ and +12′		for lat −21°

830 A spot of normal form

at 264 5	325 4	− 8 4	
267 4	325 0	− 8 2	
273 4	326 9	− 8 1	
	Diurnal motions +14′ and −2′		for lat −8°

831 A dot precedes, the influence of which cannot be estimated, and the observations are otherwise unfavourable

832 This spot first coalesces from a double form and then fairly divides anew The motions appear small, but the observations do not admit of exact statement

834 See 811

835 and 853 See also 785 and 809 The form of 809 in the second rotation was very irregular I therefore estimate the following general position on Sept 4th from the diagrams

Second rotation	at 247 5	240	−24 5
Third rotation	at 273 4	228 5	−25 9
	275 5	228 0	−25 5
	276 5	227 7	−25 4
	277 5	226 8	−25 3
	279 5	225 5	−25 5
	281 4	225 0	−25 9
Fourth rotation	at 297 6	220 5	−27 0
	301 4	217 0	−27 8
	302 5	216 1	−27 7
	303 5	215 5	−27 7
	305 5	213 8	−27 8

I also extract some observations of 873

Fifth rotation (?)	at 326 5	202 5	−26 3
	331 4	200 4	−25 1
	332 6	200 4	−25 1
	335 5	199 9	−24 7

The mean positions will be nearly the following

	at 247 5	240	−24 5
	275 5	227 8	−25 6

	303 5	215 4	−27 8
	331 5	200 4	−25 1

The last or supposed fifth rotation most probably belongs to the same spot, but not strictly to the same nucleus The second, third and fourth rotations concur in giving

Diurnal motions −26′ and +4′ for lat −26°

and it will be noticed particularly that we have here a total movement over 42 degrees

836 A normal spot of moderate size divides in two On consideration of the diagrams and particular points observed, it appears that the only way of deducing the motion correctly in this instance, is by comparing the single position of Sept 30th with the mean of the two nuclei of October 6th

Thus	at 273 4	201 7	−26 4	
	279 5	197 4*	−26 8*	
	Whence diurnal motions		−43′ and +4′	for lat −26°

838 The second and third observation can alone be compared

at 279 5	167 5	+11 6	Means	
	161 7	+11 3	164 6	+11 5
281 4	168 2	+11 4		
	162 0	+12 0	165 1	+11 7
	Diurnal motions		+15′ and +6′	for lat +12°

839 Two groups of which one has been treated of under 792 The second affords four comparable positions, and probably forms part of 858 in the next rotation

B	at 281 4	137 5	+10 1	
	282 6	137 0	+10 0	
	285 5	136 7	+10 1	
	287 6	136 8	+10 3	
	Diurnal motions		−7′ and +4′	for lat +10°

840 See 816

842 New group on the site of 817 Inspection of the projected drawings shows that the right-hand portion retains nearly the same position throughout its considerable change of structure The motions of the group may accordingly be taken as half those of the principal nucleus on the left

	at 279 5	121 7	+11 5	
	281 4	123 3	+ 9 8	
	282 6	124 4	+10 0	
	285 5	126 6	+10 3	
	287 6	126 3	+ 9 9	for the nucleus

I compare the following as mean places

at 281 5	123 4	+10 1	
286 5	126 5	+10 1	
Motions of the spot about		+37′ and zero	in lat +10°
Diurnal motions of the group		+18′ and zero	for lat +11°

843 Only two days' observations are comparable

			Means		
at 287 6	57 3	+16 1			
	52 7	+16 3	55 0	+16 2	
289 7	58 1	+16 6			
	52 2	+16 4	55 2	+16 5	
	Diurnal motions	+6′ and +9′			for lat +16°

844 I regard this as three distinct groups

A lying between 33° and 46° of longitude I think the following observations will give true motions of the spot they relate to

at 285 5	39 5	−15 1	
287 6	39 0	−14 8	
289 7	37 9	−14 9	
290 5	37 4	−15 1	
292 5	37 3	−15 4	
293 4	37 0	−15 6	
295 5	36 7	−15 3	
Whence diurnal motions	−18′ and +5′		for lat −15°

B The great mass in longitude 25°, which appears to be represented by 865, the next rotation, but which is unfitted for numerical treatment

C A normal circular spot as follows

at 289 7	9 9	− 8 3	
290 5	9 9	− 8 5	
292 5	10 6	− 8 7	
293 4	10 6	− 8 7	
295 5	10 6	− 8 3	
Of which diurnal motions	+10′ and +3′		for lat −8°

847 A well defined dot

at 290 5	336 0	+30 7
292 5	337 4	+30 4

I suspect the longitudes

848 Refer to the diagrams Two spots near together but still separated, coalesce and are contained within a considerably extended penumbra, which afterwards again divides, and we have finally the two detached spots at about 3 degrees distance apart Notice the rotation (left-handed in the diagram) of the line of direction joining the two centres The figures give a rotation of about 4 degrees per diem The drifts may be inferred from the following adopted mean positions

at 292 5	318 5	−15 5	
301 5	316 5	−16 0	
Diurnal motions	−13′ and +3		for lat −16°

850 The interval between the first and second observation is too great for safe comparison

851 Two groups The first a normal spot

A	at 295 5	264 8	−9 4	
	297 6	265 4	−9 4	
	301 4	267 4	−8 9	
	302 5	268 0	−9 2	
		Diurnal motions +28′ and +5′		for lat −9°

B The observations do not admit of treatment

852 It will be noticed that the scattered portion on the right-hand side which is lost on Nov 1st is afterwards reformed, and the principal spot on the left increased in extent The drift is evidently large and may be inferred from the adopted means

at 301 5	230 2*	+15 4!	
307 5	236 0*	+16 4*	
	Diurnal motions +60′ and +10′		for lat +16°

853 See 835

854 This group had better be discussed in two sets of four observations each

1	at 301 5	211 3	−2 8	Means		
		203 3	−3 3	207 3	−3 0	
	302 5	211 3	−2 7			
		203 0	−3 4	207 2	−3 0	
	303 5	211 2	−2 8			
		203 3	−3 1	207 3	−3 0	
	305 5	210 9	−2 7			
		203 8	−3 5	207 3	−3 1	
		Indicating no motion whatever				for lat −3°
2	at 305 5	217 7	−2 8	Means		
		210 9	−2 6	214 3	−2 7	
	306 5	218 4	−3 0			
		210 6	−2 7	214 5	−2 8	
	307 5	218 7	−2 9			
		210 1	−2 5	214 4	−2 7	
	308 5	219 3	−2 9			
		210 3	−3 0	214 8	−2 9	
	309 5	too near the limb				
		Also indicating no motions				for lat −3°

Probably the best set of observations so near the Equator

855 and 873 B I take these to be the same spot

First rotation .	at 308 5	194 9	−19 9
	309 5	193 7	−19 5

Second rotation	at 331 4	192 0	−20 3	
	332 6	191 7	−20 4	
	335 5	190 8	−20 2	
	336 5	190 9	−20 3	

By comparison of the two rotations there result

Diurnal motions −7′ and +1′ for lat −20°

858 I think the three principal components of this correspond respectively with 839 and 842 of the previous rotation, and 877 of the next I write the observed positions separately, as these spots exhibit no mutual action

	A.		B	
at 305 5	138 9	+11 9	128 8	+10 0
306 5	138 9	+11 9	128 8	+ 9 9
307 5	138 4	+12 2	128 5	+ 9 9
308 5	138 6	+12 0	129 2	+ 9 7
309 5	138 3	+12 1	128 8	+10 4
313 6	——	——	128 8	+10 2

	C	
at 307 5	140 2	+8 0
308 5	140 6	+7 9
309 5	140 6	+8 2
313 6	139 3	+8 7

The last observation of C is opposed to its identity with 877 With respect to A and B it may be more correct to remark that the motions of 839 and 842 are shown by the above observations to be arrested These two spots concurrently give

Diurnal motions −4′ and +4′ for lat +11°

859 Compare 841 See diagrams

860 May be two groups, but I treat it as one

			Means	
at 309 5	135 3	+24 0		
	125 4	+28 0	130 4	+26 0
313 6	136 5	+23 5		
	124 9	+27 4	130 7	+25 5

Diurnal motions +5′ and −7′ for lat +26°

862 Insufficiently observed for any discussion

864 Probably two groups Neither admit of discussion See diagrams and group 884

865 I take the Southern spot in long 24° by −16° to be the remains of the principal spot 844 B, but do not venture to record the result of comparison Neither do I think the observations of the present rotation can be safely discussed in presence of the

large spot in lat —10° so near to it It is more worth notice to observe the left-handed rotation of the line joining these nuclear centres Notice 886, another group here, the next rotation

866 First with a penumbra and then without But the observation on Nov 11th is either faulty or of another one

at 319 5	359 8	−18 2	
320 5	359 8	−18 3	
322 5	359 2	−18 4	
Diurnal motions −12′ and +4′			for lat −18°

867 A normal circular spot

at 315 6	345 5	−7 9	
319 5	345 0	−8 1	
320 5	344 6	−7 9	
322 5	344 9	−8 4	
323 5	344 7	−8 6	
326 5	344 0	−9 1	
Whence diurnal motions −5′ and +7′			for lat −8°

868, 880 and 908 We seem to have the very first dot of this group, the development and divergence of which was terminated on the fifth day of appearance And as the "following" component rapidly disappeared I direct attention to the "preceding" one only

First rotation	at 322 5	339 2	+11 2	
	323 5	339 5	+11 1	
	326 5	339 6	+10 9	
Second rotation	at 343 5	339 3	+10 8	
	344 5	340 0	+10 7	
	349 5	340 8	+10 9	
	351 6	340 4	+10 9	
	352 5	340 1	+10 9	
	353 5	340 3	+10 9	
	354 5	339 6	+10 8	(near the limb)
Third rotation	at 370 5	342 3	+11 1	
	371 6	341 9	+11 3	
	372 5	342 2	+11 5	
	373 5	342 6	+11 6	
Taking mean places				
	at 324 2	339 4	+11 1	
	350 3	340 3	+10 9	
	372 2	342 3	+11 4	

The positive motion in longitude increases from 2′ to 6′

Take diurnal motions +4′ and zero for lat +11°

869 See diagrams Principal spot taken

at 319 5	299 9	+21 4	
320 5	297 5	+21 6	
322 5	297 5	+21 4	
323 5	296 5	+21 4	
326 5	296 4	+21 1	
331 4	295 0	+21 5	(near the limb)

Diurnal motions −27′ and −3′ for lat +21°

871 A group 893 follows, in the position of the dots which precede in long 265° The observations are

at 322 5	255 2	−21 0	
323 5	254 9	−21 0	
326 5	253 5	−20 7	
331 4	251 5	−20 0	
332 6	251 5	−20 3	

Diurnal motions −22′ and −5′ for lat −21°

872 Normal spot observed as follows

at 326 5	213 2	− 9 7	
331 4	213 8	− 9 6	
332 6	213 5	− 9 8	
335 5	212 6	− 9 7	
336 5	212 8	− 9 9	

Diurnal motions −3′ and /c10 for lat −10°

873 The spot in lat −20° is 855, which see The southern spot was observed as follows

at 331 4	200 4	−25 1	
332 6	200 4	−25 1	
335 5	199 9	−24 7	

Diurnal motions −9′ and −7′ for lat −25°

874 There are three groups under this number, as the diagrams show No discussion is possible See 859

875 Very similar to 874 C above it.

at 331 4	195 9	+11 3	Means	
	191 2	+12 1	193 6	+11 7
332 6	197 9	+10 2		
	190 3	+12 2	194 1	+11 2
335 5	199 2	+10 4		
	191 0	+12 5	195 1	+11 4
336 5	199 8	+10 6		
	191 7	+12 8	195 8	+11 7

Diurnal motions +24′ and zero for lat +11°

(876) A dot nearly on the Equator.

at	331 4	163 1	−0 5
	332 6	163 3	−0 4

Diurnal motions +10′ and −6′ for lat −0°

876 Two groups, principally dots

877 and 899 I do not transcribe all the observations, but guided by the diagrams take the following

877	at	335 5	143 7	+8 1
		336 5	144 1	+8 0
899	at	360 5	145 4	+8 0
		366 5	146 2	+8 4

Diurnal motions +4′ and +1′ for lat +8°

880 and 903 The change and division of the large nucleus probably invalidate conclusions of motion in latitude

880	at	335 5	99 1	+7 5
		336 5	100 2	+7 5
		343 5	100 3	+6 5
		344 5	100 2	+6 1
903	at	366 5	102 2	+5 7
		367 5	102 3	+5 7
		368 6	102 8	+5 9
		370 5	102 3	+5 3
		371 6	101 7	+5 3 (near the limb)

Say diurnal motions +5′ and −3′ for lat +7°

882 A spot of which more observations would have been desirable

at	335 5	90 5	−4 0
	336 5	91 2	−3 9

Diurnal motions +42′ and −6′ for lat −4°

884 Better taken by itself, but see 864

at	336 5	66 3	+25 1
	343 5	63 3	+25 6
	344 5	63 1	+25 6

Say diurnal motions −20′ and +4′ for lat +25°

885 Only two observations, and I cannot estimate the effect of the numerous dots which "follow"

886 and 905 It may be a question whether this is a repetition or redevelopment of 844 If comparison of positions in this case be possible, it must be that of the following means

886	at 344 5	34 0	−18 0	
905	366 5	32 2	−16 8	
	Which give diurnal motions −5′ and −3′			for lat −18°

887 I write the spots separately, and take the mean of the motions for the mean position

	A		B		
at 343 5	349 8	+31 2			
344 5	350 1	+31 3	339 9	+33 0	
349 5	348 5	+31 4	335 2	+34 2	
351 6	——	——	333 9	+34 7	
352 5	——	——	333 5	+34 9	
	Mean diurnal motions −30′ and +8′				for lat +33°

889 See 868 and 908

890 A normal circular spot, as follows

at 344 5	319 6	+7 5	(near the limb)
349 5	321 0	+7 3	
351 6	321 3	+7 0	
352 5	321 6	+7 1	
353 5	321 7	+7 3	
354 5	321 4	+7 3	
	Diurnal motions +8′ and zero		for lat +7°

892 The right-hand component is imperfectly developed and wanting in the third observation On the indication of the two first I deduce the motion of the group in longitude from half that of the other spot

Spot	at 353 5	264 0	−7 3	
	354 5	265 8	−7 2	
	358 6	268 0	−7 9	
	Say diurnal motions of group +20′ and +8′			for lat −7°

893. I think the following may be compared See figures

at 353 5	262 9	−15 4	
354 5	263 9	−15 4	
358 6	263 0	−15 4	
360 5	263 5	−15 1	
	Diurnal motions −2′ and −2′		for lat −15°

894 On reference to the diagrams, it will be seen that first one and then the other principal spot divided into two distinct nuclear spots of normal form The observations are not suitable for determination of motions

896 Three observations admitting of comparison

at 354 5	207 4	+13 3	Means		
	198 0	+15 9	202 7	+14 6	
358 6	210 9	+12 2			
	199 7	+15 6	205 3	+13 9	
360 5	211 5	+12 7			
	200 2	+16 0	205 9	+14 3	

Diurnal motions $+35'$ and $-6'$ for lat $+14°$

897 Normal spot observed twice only

at 358 6	182 0	−23 4	
360 5	181 9	−23 5	

Diurnal motions $-3'$ and $+3'$ for lat $-23°$

898 See 876 and 912 Too imperfect to compare

899 See 877

901 See 914 No comparison possible

903 See 880

904 Three small groups of varying dots

905 See 886 The three last observations also afford an independent result for drift

at 6 6	39 5	−17 0	Means	
	31 8	−16 6	35 6	−16 8
7 5	40 0	−17 5		
	31 4	−16 7	35 7	−17 1
8 5	40 6	−17 7		
	31 3	−17 1	36 0	−17 4

Diurnal motions $+12'$ and $+18'$ for lat $-17°$

907 The motions cannot be unobjectionably deduced

908 See 868. Of the second group only one observation

909 Neglecting possible action of the dots following.

at 8 5	294 1	−11 3	
15 5	293 6	−10 5	

Diurnal motions $-4'$ and $-6'$ for lat $-11°$

911 and 925 B A spot of unusual duration nearly under the equator See figures

911	at 15 5	206 0	− 1 0	
	25 5	205 8	− 0 7	
	26 5	204 2	− 1 1	(near the limb)

At the next rotation

925 B	at 42 5	209 3	− 2 0	
	47 5	207 9	− 2 7	

It is improbable that two such similar spots so similarly situated in so rare a position should not be the same, and yet the observed motions are clearly opposed to their identity, and it is most unusual for a spot on the equator to remain visible beyond three or four days It seems preferable to suppose them different and treat them separately, on the greater probability of the case being one of repetition or renewal of outbreak In which case

	Diurnal motions − 4′ and zero	for lat −1°
by 925 B	—— −17′ and +9′	for lat −2°

918 Too large and irregular for accurate definition

914 Taking the mean of the extreme positions

			Means	
at 25 5	155 3	− 9 3		
	143 5	−13 0	149 4	−11 2
26 5	156 9	− 9 3		
	143 1	−13 2	150 0	−11 2
27 5	158 1	− 9 8		
	142 9	−13 6	150 5	−11 7
28 5	158 3	− 9 4		
	142 7	−13 1	150 5	−11 2

Diurnal motions +24′ and +6′ for lat −11°

915 Three groups, all insignificant One appears to be the precursor of a considerable group recorded in the next rotation as 932

916 See diagrams Comparisons impracticable

919 Two different spots The second must be referred to 936 of the next rotation

920 to 923 Too fragmentary for discussion

924 Rather too large and undefined for accuracy

at	40 6	246 6	+13 1
	42 5	246 4	+13 4
	47 5	245 0	+13 7

Diurnal motions −14′ and +5′ for lat +13°

925 A group A and detached spot B The principal spot of A is too much altered in the interval between the two observations for comparison See 911 in reference to B

926 The following are the only observations

at 42 5	216 1	+7 9	
47 5	215 6	+8 3	
Whence diurnal motions	−6′ and +5′		for lat +8°

927 and 944 A well defined oval spot, but with dots infesting the neighbourhood

First rotation

at 40 6	220 5	−25 4	
42 5	219 6	−25 6	
47 5	216 2	−26 8	

Second rotation

at 69 5	208 9	−25 8	
70 6	206 9	−25 5	
71 6	208 6*	−25 8	
72 5	206 0	−25 1	
73 5	205 2	−25 3	
Diurnal motions	−26′ and zero		for lat −26°

928 Two groups, but only once observed

930 Again, two groups The second probably the same as 950, which see

931 A normal spot The first observation, however, on which the motion much depends, taken near the limb

at 47 5	141 7	−22 5	
56 4	134 2	−23 7	
57 5	134 0	−23 3	
58 5	133 6	−23 9	
Say diurnal motions	−24′ and +6′		for lat −24°

932 Unsuited for numerical treatment See 915 and 951

936 A detached spot A and two groups B and C which trench on one another. I compare A with the second appearance numbered 919

919	at 37 6	42 5	+8 1	
936A	56 4	48 2	+7 0	
	57 5	48 7	+6 9	
	58 5	48 6	+7 0	
	Diurnal motions	+18′ and −3′		for lat +8°

The two groups are too entangled for discussion

937 The last three observations of the small spot which survives the group might perhaps be compared, but the result would not be beyond objection

938 I reject the two first observations The following observations were made on the "preceding" spot of the two, which will not affect the result, as the distance appears to have remained unchanged throughout

at 65 5	321 5	−21 1	
67 4	321 5	−21 1	
68 5	321 3	−20 8	
69 5	320 9	−21 4	
70 6	321 7	−21 3	
71 6	321 6	−20 9	

Diurnal motions zero and +4′ for lat −21°

939 A renewed outbreak in the region of 922

			Means	
at 68 5	313 0	−10 4		
	310 4*	−12 0	311 7	−11 2
69 5	314 8	−10 5		
	309 4*	−12 1	312 1	−11 3
70 6	315 8	−10 1		
	308 5	−12 5	312 2	−11 3
71 6	317 0	−10 1		
	308 2	−12 3	312 6	−11 2

Diurnal motions +15′ and zero for lat −11°

940 The circular spot shows very rapid motion

at 67 4	288 9	−6 7	
68 5	290 7	−6 6	
69 5	292 2	−7 6	(no error but bad)
70 6	294 4	−6 0	

Diurnal motions +108′ and −3′ for lat −7°

A second outbreak occurs, but the form is not definite enough for observations to fix the motion

941 I pass over the first observation, and at the same time point out that the general direction of the group rotates right-handedly, and that the first observation is material to the evidence

			Means.	
at 69 5	281 5	+12 1		
	274 2	+13 0	277 9	+12 6
70 6	282 3	+12 5		
	274 2	+12 7	278 2	+12 6
71 6	282 6	+12 8		
	275 7	+12 4	279 1	+12 6

72 4	283 0	+12 8			
	275 4	+12 9	279 2	+12 8	
73 5	282 9	+12 6			
	275 5	+11 7	279 2	+12 2	
	Diurnal motions +24′ and zero				for lat +13°

942 Some traces of a group follow the main spot

at 67 4	241 8	−11 2		
68 5	241 8	−11 3		
69 5	241 8	−11 2		
Diurnal motions zero and zero				for lat −11°

943 Observed twice only

at 72 4	225 7	+20 3	Means		
	222 3	+19 2	224 0	+19 7	
73 5	226 9	+20 1			
	221 2	+19 6	224 0	+19 8	
	Diurnal motions zero and +6′				for lat +20°

944 A and B A is treated under 927 For B I find the following Spot small and circular

at 70 6	200 1	−20 3	
71 6	199 5	−20 3	
72 4	199 2	−20 2	
73 5	198 6	−20 8	
Diurnal motions −27′ and +6′			for lat −20°

946 There are dots following the principal spot

at 70 6	195 4	−9 4	
71 6	194 4	−9 0	
72 4	195 4	−8 5	
73 5	196 0	−8 4	
76 4	196 8	−8 9	
79 4	197 5	−9 9	
80 4	198 0	−9 4	
Diurnal motions +19′ and +5′			for lat −9°

947 Two separate groups Cannot discuss either

949 Large circular normal spot

at 73 5	149 2	−12 0	(near the limb)
76 4	147 8	−12 6	
79 4	148 2	−12 6	

80 4	148 1	−12 1	
81 6	148 0	−11 8	
82 4	148 0	−11 7	
	Diurnal motions −5′ and −6′		for lat −12°

950 Merely a plain dot

at 76 4	145 5	+6 9	
79 4	145 8	+6 5	
80 4	146 0	+6 7	
	Diurnal motions +6′ and −4′		for lat +7°

951 See 932 The series is broken off after the fourth observation A normal spot and a large group First the spot A

A	at 76 4	115 8	+19 0		
	79 4	114 4	+19 1		
	80 4	114 3	+18 9		
	81 6	113 7	+19 2		
	82 4	113 4	+19 2		
		Diurnal motions −22′ and zero			for lat +19°

B The group of three nuclear spots

			Means	
at 79 4	97 7	+14 0		
	84 0	+15 1	90 8	+14 6
80 4	99 6	+14 9		
	84 2	+15 3	91 9	+15 1
81 6	100 4	+15 4		
	83 5	+15 8	92 0	+15 6
82 4	100 4	+15 4		
	82 8	+16 2	91 6	+15 8

The observations are not unexceptionable They give for
Diurnal motions +15′ and +24′ for lat +15°

952. A single dot, once seen nuclear

at 79 4	89 4	−7 8	
80 4	89 7	−7 9	
81 6	89 5	−8 5	
82 4	89 8	−8 4	
	Diurnal motions +3′ and +18′		for lat −8°

Before assembling the foregoing results for final discussion, I have to add one other observation from a foreign source, on account of the high latitude to which it relates It was communicated to me by Professor Peters, of Hamilton College, Clinton, New

York, and was made by him at the Observatory at Naples in the year 1846 The spot observed was nuclear, and of a form generally round, and was followed first by one and then three small detached spots at some distance From the observations sent me, by reduction with the elements used throughout for my own observations, I have found the following results, arranged as in the Table of Redhill observations

Naples M.T		Dist	Pos	Fr Node	H Long	H Lat
June 8^{d}	0^{h} 52^{m}	9041	19° 32′	134° 20′	134° 20′	+50° 2′
„ 13	0 26	7799	339 32	199 42	129 2	+50 55

from which result

Diurnal motions −64′ and +11′ for lat +50°

I know of no other spot reliably observed as yet in so high a latitude The next in order appears to be my observation of a group in lat 45° South, which will be found under No 290

I next extract and arrange in a table all the diurnal motions above deduced, placing them in order of latitude from North to South, and under each degree of latitude in order of date The results are further written in three columns In the first are placed all results of well-observed normal spots and of double rotations, in the second results of less but of tolerable average value, relation being had to the number of observations and the interval over which they extended, and in the third column results of decidedly inferior value

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TABLE OF RESULTING DIURNAL MOTIONS

Lat.	Group	I	II	III
+ 50°	Peters			−64′ +11′
+ 37	236			−78 −30
	465			−55 − 4
+ 34	224	−42 + 3		
	645		−48 + 7	
+ 33	706		−36 + 6	
	887		−30 + 8	
+ 32	125		−30 − 2	
+ 31	135		−33 − 3	
	620			+12 − 6
	748	−30 +10		
	797		−50 − 4	
+ 30	209		−30 + 3	
	453 , 478	−18 − 2		
+ 29	176		−18 +10	
	245			−42 0
	485		−50 + 6	
+ 28	143			− 4 +24

Lat	Group	I		II		III	
	171	−25	+20				
	264			−33	+ 6		
	520			−38	− 4		
	803	−31	− 4				
+ 27	779 , 803	−30	0				
	825			−14	+14		
+ 26	194			− 7	+ 7		
	241	−31	− 2				
	551 , 569	−20	+ 2				
	573 , 592	−10	− 4				
	779	−30	+ 1				
	860					+ 5	− 7
+ 25	799			− 4	+ 2		
	884			−20	+ 4		
+ 24	162 , 168	−10	0				
	168			−12	+12		
	254					−36	−12
	711	−20	+ 4				
+ 23	181			−20	+10		
	341 , 357	−24	0				
	519			−28	+ 5		
	752 , 776	−20	+ 5				
	816 , 840	−11	− 3				
+ 22	181 , 189	−12	− 3				
	199			−38	−12		
	581 , 598	− 2	− 1				
	608					−16	+ 1
	840	−16	+ 3				
+ 21	496 , 516	−16	0				
	516 , 535	−16	0				
	525			−14	− 6		
	670 , 692	− 7	+ 2				
	869			−27	− 3		
+ 20	174			− 6	+ 1		
	184			− 4	0		
	230					+24	0
	285			−12	− 7		
	497					−22	0
	648 , 670	− 9	0				
	687			− 5	−10		
	697	−15	+ 7				
	943					0	+ 6
+ 19	32 , 38	−13	+ 3				
	187			−12	+ 3		
	412			−16	+ 4		
	658	− 1	− 1				
	678					−36	+ 8
	722			+33	−27		
	762 , 789	−11	0				
	951	−22	0				
+ 18	425			−12	−12		
	457			−30	0		
	632			+25	+10		

Lat	Group	I	II.	III
+ 17	27			+15 + 6
	703			−18 + 6
	723			−12 + 3
	733		−13 − 2	
	770	−10 − 3		
+ 16	278		+ 8 − 8	
	471			+10 − 3
	757	−17 + 3		
	792		− 6 − 1	
	843			+ 6 + 9
	852			+60 +10
+ 15	646		+10 − 5	
	709		− 6 0	
	715		−14 −12	
	720		−15 + 3	
	792 , 815	− 6 + 1		
	815 , 839	− 4 0		
	808		+20 + 2	
	814	+ 8 + 7		
	951			+15 +24
+ 14	73		+ 9 − 4	
	248		− 9 0	
	577			− 6 +10
	582		− 3 + 3	
	705			+12 −10
	691 , 712	− 3 − 3		
	712	−15 0		
	896		+35 − 6	
+ 13	278		+27 +15	
	318		−10 + 2	
	408	−10 −8		
	466			+15 − 4
	488			0 + 3
	673		− 6 − 6	
	755		− 4 + 2	
	924		−14 + 5	
	941		+24 0	
+ 12	2 , 7	+ 9 −6		
	11			+ 8 −16
	44		+18 + 6	
	747		+36 − 6	
	818		+36 0	
	838			+15 + 6
+ 11	117		+24 + 2	
	751 , 775	− 2 −2		
	842		+18 0	
	858		− 4 + 4	
	868 , 889	+ 4 0		
	889 , 908	+ 4 0		
	875		+24 0	
+ 10	50		+ 9 − 3	
	66	+ 4 −4		
	95			−12 −30

Lat	Group	I		II		III	
	486			− 8	+ 6		
	768			0	+12		
	781			+ 8	0		
	817					+ 9	+ 3
	839			− 7	+ 4		
+ 9	7 , 15	+ 5	−10				
	29					+35	− 9
	91					+12	− 6
	508					+ 6	+ 8
+ 8	36					+ 4	− 6
	69	+ 8	+ 8				
	80					+13	− 4
	93					+27	0
	107	+12	− 8				
	491					+38	+20
	531 , 550	+13	+ 4				
	618			−11	− 1		
	725	+14	− 4				
	755					+12	− 6
	787			− 5	+ 2		
	877 , 899	+ 4	+ 1				
	926			− 6	+ 5		
	919 , 936	+18	− 3				
+ 7	25 , 31			+ 4	− 2		
	121	+ 4	− 1				
	218					0	+30
	396 , 407	+19	− 1				
	880 , 903	+ 5	− 3				
	890	+ 8	0				
	950	+ 6	− 4				
+ 6	58	+ 4	− 4				
	61					0	0
	114					+48	0
	553			+ 4	− 4		
	629			+16	+ 8		
	671			+30	− 7		
	778					+30	+10
+ 5	1			+21	− 4		
	99			+17	+17		
	778					+80	+24
+ 4	97			+10	+ 4		
	137			+13	+24		
	708			+22	−22		
+ 3	165			+38	− 2		
− 0	(876)					+10	− 6
− 1	911			+ 4	0		
− 2	925			−17	+ 9		
− 3	812					0	− 8
	854	0	0				
− 4	683			+ 6	− 3		
	882					+42	− 6

Lat	Group	I	II	III
− 5	659			+24 −12
− 6				
− 7	22			+30 + 6
	92			+60 − 9
	442			+ 3 + 3
	653 , 677	+10 − 1		
	892		+20 + 8	
	940			+108 − 3
− 8	64			+20 0
	102			+36 +20
	123	+10 − 4		
	219			0 0
	500			+ 4 + 6
	830		+14 − 2	
	844	+10 + 3		
	867	− 5 + 7		
	952		+ 3 +18	
− 9	86	+ 2 + 1		
	281	+ 1 − 4		
	494			+12 + 8
	622		+10 − 8	
	851	+28 + 5		
	946	+19 + 5		
− 10	297	+ 4 0		
	613			+30 +12
	765			+33 + 6
	872	− 3 0		
− 11	57 , 59	+ 5 − 2		
	105			+16 − 6
	909		− 4 − 6	
	914		+24 + 6	
	939		+15 0	
	942			0 0
− 12	6 , 14	+ 4 0		
	35			0 0
	113	+ 5 + 5		
	268		+20 − 6	
	293		− 3 − 4	
	546			0 0
	579 , 613	0 0		
	701	+18 + 4		
	710 , 730	− 3 + 2		
	730 , 753	− 2 − 1		
	753 , 777	0 − 2		
	811 , 834	−10 + 6		
	827			0 −12
	949	− 5 − 6		
− 13	459		+ 1 0	
− 14	291	− 4 − 1		
	439		0 − 2	
	440		− 7 − 3	
	479		0 0	
	568			− 2 − 4
	647			+ 8 − 8

Lat.	Group	I.	II.	III
	674	− 6 0		
− 15	51	− 9 − 3		
	656		+ 9 − 2	
	749			− 3 + 5
	777		0 −10	
	844	−18 + 5		
	893		− 2 − 2	
− 16	297			+30 +24
	437			0 − 2
	494		−20 − 5	
	597		−13 − 8	
	739			+ 8 + 1
	848		−13 + 3	
− 17	177			−12 − 2
	182		+10 − 5	
	207	−10 0		
	208		− 5 − 3	
	306		− 9 +12	
	406		− 2 − 2	
	758	−21 + 2		
	777		− 4 + 1	
	905			+12 +18
− 18	250		+ 9 −12	
	649	− 6 + 5		
	736			+34 + 9
	769	− 8 0		
	807	−10 − 3		
	866		−12 + 4	
	886 , 905	− 5 − 3		
− 19	201		−17 − 5	
	315 , 332	− 9 0		
	374		−15 +10	
	518		−14 + 3	
	601		−29 − 1	
− 20	170	−16 + 3		
	178		+15 0	
	260		+ 6 + 4	
	267		+15 − 4	
	296	−24 + 4		
	855 , 873	− 7 + 1		
	944		−27 + 6	
− 21	282			−30 +12
	293			− 3 +18
	296	−15 + 1		
	295	−23 + 7		
	829			−34 +12
	871		−22 − 5	
	938		0 + 4	
− 22	146 , 157	− 8 0		
	157 , 161	−14 + 1		
	166			−42 − 6
	231			0 0
	257			+6 +18
	269	−14 + 3		

Lat.	Group	I	II.	III
	270			+ 6 − 6
	292	−15 − 4		
	679		− 3 0	
	702		+24 −15	
	721		−30 + 7	
	760	−20 + 2		
	786 , 813	−18 − 1		
	813		−40 − 9	
− 23	150			−30 +18
	193		−14 − 3	
	444			−31 + 4
	793		−14 + 2	
	897			− 3 + 3
− 24	141			−10 0
	284			−21 − 6
	650	−24 + 5		
	931		−24 + 6	
− 25	124		− 5 + 3	
	518		−28 + 1	
	619		−28 + 7	
	717			+55 −12
	809 , 835	−26 + 4		
	835 , 853	−26 + 4		
	873			− 9 − 7
− 26	336			−33 + 6
	604			−17 − 8
	790		−30 + 4	
	836		−43 + 4	
	927 , 944	−26 0		
− 27	180	−40 0		
− 28	128		−24 + 2	
	140		− 5 − 1	
	158		−60 +12	
	147		−30 +10	
	575	−40 − 3		
− 29	138	−24 + 7		
	144		−30 0	
	173	−38 − 6		
	220 , 229	−36 + 1		
	233		−50 + 8	
	566			−58 + 4
− 30	142			+14 +14
	526 , 547	−38 + 2		
	728			−24 +15
− 32	564		−52 − 5	
− 33	249		−36 −10	
− 34	139	−44 + 3		
	309		−78 −12	
	327		−62 − 4	
	771			+57 −12
− 36	132		−50 + 6	
− 45	290		−92 − 8	

It is desirable in the next place to take approximate means of the above single results, in order to inspect the probable result of the inquiry, and judge of the further treatment required I therefore conjecturally assign the weights 4 and 1 to the results in columns I and II respectively, and in a first solution reject III altogether This treatment leads to the following table of approximate mean drifts The sign + in latitude-motion indicates increasing latitude or motion towards the Pole in each hemisphere, as before stated

Lat.	D Motion		Weight.	Lat	D Motion		Weight
	′	′			′	′	
+ 36°	—	—	—	− 36°	−50	+ 6	1
35	—	—	—	35	—	—	—
34	−43	+ 4	5	34	−41	− 1	7
33	−33	+ 7	2	33	−36	−10	1
32	−30	− 2	1	32	−52	− 5	1
31	−34	+ 5	6	31	—	—	—
+ 30	−20	− 1	5	− 30	−38	+ 2	4
29	−34	+ 8	2	29	−34	+ 1	14
28	−30	+ 6	10	28	−35	+ 1	8
27	−27	+ 3	5	27	−40	0	4
26	−22	− 0	17	26	−30	+ 1	6
25	−12	+ 3	2	25	−20	+ 3	12
24	−15	+ 3	9	24	−24	+ 5	5
23	−19	+ 2	14	23	−14	− 0	2
22	−12	− 1	13	22	−14	− 0	28
21	−14	− 0	14	21	−17	+ 3	10
+ 20	−10	+ 1	12	− 20	−11	+ 2	16
19	−10	− 1	19	19	−14	+ 1	8
18	− 6	− 1	3	18	− 5	− 1	19
17	−11	− 3	5	17	−10	+ 1	13
16	− 3	+ 1	7	16	−15	− 3	3
15	+ 0	+ 2	18	15	− 9	− 0	11
14	− 3	− 2	12	14	− 4	− 1	11
13	− 2	− 1	10	13	+ 1	0	1
12	+18	− 3	7	12	+ 1	+ 1	38
11	+ 5	− 0	16	11	+ 8	− 1	7
+ 10	+ 2	+ 0	9	− 10	+ 1	0	8
9	+ 5	−10	4	9	+12	+ 1	17
8	+ 9	− 0	27	8	+ 6	+ 3	14
7	+ 8	− 2	21	7	+14	+ 1	5
6	+ 9	− 3	7	6	—	—	—
5	+19	+ 6	2	5	—	—	—
4	+15	+ 2	3	4	+ 6	− 3	1
3	+38	− 2	1	3	0	0	4
2	—	—	—	2	−17	+ 9	1
1	—	—	—	1	− 4	0	1

Inspection of the foregoing table shows at once that the diurnal motions in longitude are subject to a well-marked law of variation depending on the latitude, while it is not apparent that the motions tabulated for the latitude are anything beyond the accidental differences of observation Trial readily shows that no parabolic curve or expression of

the form a sin l or a $\sin^2 l$ will satisfy the above values, but that the whole table of results for longitude may very fairly be represented by the expression

$$+14' \quad -165' \quad \sin^{\frac{1}{4}} l$$

which expanded gives the following values

Lat	D Motion	Lat.	D Motion	Lat	D Motion
	′	°	′	°	′
± 36	− 51 1	± 24	− 20 2	± 12	+ 3 4
35	48 4	23	17 9	11	4 9
34	45 7	22	15 6	10	6 3
33	− 43 4	21	− 13 4	9	+ 7 6
32	40 3	20	11 2	8	8 8
31	37 6	19	9 1	7	9 9
30	35 0	18	− 7 1	6	10 9
29	32 4	17	5 2	5	11 7
28	29 9	16	3 3	4	+ 12 4
27	27 4	15	− 1 5	3	13 0
26	25 0	14	+ 0 2	2	13 6
± 25	− 22 6	± 13	+ 1 8	± 1	+ 14 0

It will be remembered that these values correspond to an assumed general period of Rotation of 25 380 mean solar days, or to a general Rotation of 14° 11′ per solar day, a value which is now shown to apply only to the latitude of 14° N and S

I now proceed to a more accurate discussion of the individual results first tabulated The approximate solution first obtained affords the means of comparing each separate result of columns I II and III with an approximate result derived from the whole, of averaging the differences and deriving the weights suitable to be employed Having performed this operation, I have found that the mean error of a single result in column I is 5′ 5, whether derived from a single or from two rotations (confirming my previous belief, on which I ventured so to class them), that the mean error of results in column II was 13′, and of III was 16′ The proper weights to apply to the results of the three columns would accordingly be 33, 6 and 4 respectively, or 4, ¾ and ½ It will be sufficiently near and more convenient to use the weights 10, 2 and 1 The mean errors which lead to this rule accordingly indicate that the results of column III are not so inferior to those of column II as I at first supposed, and that the provisional weights employed in combining the results of I and II were as nearly as possible correct Were it not that the result under discussion is one of the chief objects of the present research, a repetition of the process performed above would be hardly worth the doing However, to check the former result and employ all the data of observation, I form the following table with the weights just found

Lat	D Motion		Weight	Lat.	D Motion.		Weight
+ 50°	−64′	+11′	1	− 45°	−92′	− 8′	2
+ 37	−66	−17	2	− 37			
36				36	−50	+ 6	2
35				35			
34	−43	+ 4	12	34	−44	− 1	15
33	−33	+ 7	4	33	−36	−10	2
32	−30	− 2	2	32	−52	− 5	2
31	−21	+ 5	15	31			
+ 30	−20	− 1	12	− 30	−33	+ 4	12
29	−36	+ 6	5	29	−34	+ 1	35
28	−28	+ 8	25	28	−35	+ 1	18
27	−27	+ 2	12	27	−40	+ 0	10
26	−21	− 1	43	26	−27	+ 0	17
25	−12	+ 3	4	25	−20	+ 3	27
24	−16	+ 2	23	24	−23	+ 4	14
23	−19	+ 1	34	23	−17	+ 3	7
22	−12	− 1	33	22	−14	− 0	72
21	−14	+ 0	34	21	−18	+ 5	27
+ 20	− 9	+ 1	31	− 20	−12	+ 2	38
19	−11	− 0	47	19	−13	+ 1	18
18	− 6	− 1	6	18	− 6	− 0	45
17	− 9	− 1	15	17	−10	+ 1	32
16	− 5	+ 2	17	16	− 6	+ 0	9
15	− 0	+ 2	41	15	−10	− 0	27
14	− 4	− 1	30	14	− 4	− 1	28
13	− 2	− 2	24	13	+ 1	0	2
12	+16	− 4	18	12	+ 1	− 0	97
11	+ 5	− 0	38	11	+ 6	− 1	18
+ 10	+ 2	− 1	22	− 10	+ 3	+ 1	22
9	+ 8	− 8	13	9	+12	+ 1	43
8	+10	− 0	71	8	+ 6	+ 3	38
7	+ 8	− 1	53	7	+21	+ 0	16
6	+11	− 2	19	6			
5	+31	+10	5	5	+24	−12	1
4	+15	+ 2	6	4	+18	− 4	3
3	+38	− 2	2	3	0	− 1	11
2				2	−17	+ 9	2
1				1	− 4	0	2
+ 0				− 0	+10	− 6	1

In the above table it will be remarked that there is more distinctly a trace of motion in latitude, the signs being on the whole + for latitudes higher N or S than 20°, though the daily polar motion between 20° and 40° of latitude on an average does not exceed 2′, a quantity which could only be deduced from the totality of a large number of single results Between the parallels of 10° to 20° the motion in latitude is evidently very small, but the signs are generally negative and a feeble tendency towards the Equator of about 1′ per diem is indicated Within 10° of the Equator on either side no reliable motion in latitude appears to exist, the signs varying much and the mean results being

of less weight It may however be inferred from these conclusions that elements of rotation will be best based on observed differences of latitude between about 8 and 18 degrees of latitude in either hemisphere, pairing them together in sets of two, one North and one South

We cannot for the motion in longitude do better than compare the above revised table with the expanded table of the expression

$$+14' - 165' \sin \tfrac{7}{4} l$$

using the latter as a normal curve, and determine a series of equidistant normal errors, with due regard to the weights

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MEAN NORMAL ERRORS IN LONGITUDE

Lat	E	Wt.	W × E	Mean W & E		Lat	E	Wt.	W × E.	Mean W & E	
+37°	−12′	2	−24′			−37°	—′	—	—′		
36	—	—	—			36	+ 1	2	+ 2		
+35	—	—	—	18	+3′0	−35	—	—	—	19	+2′4
34	+ 3	12	+ 36			34	+ 2	15	+ 30		
33	+10	4	+ 40			33	+ 7	2	+ 14		
32	+10	2	+ 20			32	−12	2	− 24		
31	+17	15	+255			31	—	—	—		
+30	+15	12	+180	59	+8 0	−30	+ 2	12	+ 24	67	−2 4
29	− 4	5	− 20			29	− 2	35	− 70		
28	+ 2	25	+ 50			28	− 5	18	− 90		
27	0	12	—			27	−13	10	−130		
26	+ 4	43	+172			26	− 2	17	− 34		
+25	+11	4	+ 44	116	+2 4	−25	+ 3	27	+ 81	75	−1 6
24	+ 4	23	+ 92			24	− 3	14	− 42		
23	− 1	34	− 34			23	+ 1	7	+ 7		
22	+ 4	33	+132			22	+ 2	72	+144		
21	− 1	34	− 34			21	− 5	27	−135		
+20	+ 2	31	+ 62	151	+0 5	−20	− 1	38	− 38	200	−0 4
19	− 2	47	− 94			19	− 4	18	− 72		
18	+ 1	6	+ 6			18	+ 1	45	+ 45		
17	− 4	15	− 60			17	− 5	32	−160		
16	− 2	17	− 34			16	− 3	9	− 27		
+15	+ 2	41	+ 82	127	−1 8	−15	− 8	27	−216	98	−5 0
14	− 4	30	−120			14	− 4	28	−112		
13	− 4	24	− 96			13	− 1	2	− 2		
12	+13	18	+234			12	− 2	97	−194		
11	0	38	0			11	+ 1	18	+ 18		
+10	− 4	22	− 88	142	+1 5	−10	− 3	22	− 66	218	−0 9
9	0	13	0			9	+ 4	43	+172		
8	+ 1	71	+ 71			8	− 3	38	−114		

Lat	E	Wt	W × E	Mean W & E	Lat	E	Wt	W × E	Mean W & E
7°	− 2′	53	−106′		7°	+11′	16	+176′	
6	0	19	0		6	—	—	—	
+ 5	+19	5	+ 95	85 +0′6	− 5	+12	1	+ 12	31 +2′4
4	+ 3	6	+ 18		4	+ 6	3	+ 18	
3	+25	2	+ 50		3	−13	11	−132	
2	—	—	—		2	− 3	2	− 6	
1	—	—	—		1	+10	2	+ 20	
+ 0	—	—	—		− 0	− 4	1	− 4	5 +2 0

We are now able to concentrate the results of observation in the following table, which is entirely independent of the expression used as temporary normal curve

ROTATION OF THE SOLAR SURFACE IN DIFFERENT LATITUDES IN ONE MEAN SOLAR DAY

Lat	Rot per diem		Rotation	Weight.	A	B
+ 50°	851′	−64′	= 787′	1		
35		−45	806	18	−3′	−1′
+ 30		−27	824	59	−8	−5
25		−20	831	116	−2	0
+ 20		−11	840	151	−0	+2
15		0	851	127	−2	0
+ 10		+ 8	859	142	−2	0
5		+12	863	85	−1	0
Equator		+16	867	5	−2	−2
− 5		+14	865	31	−2	−3
− 10		+ 5	856	218	+1	0
15		− 6	845	98	+5	+3
− 20		−12	839	200	+0	−1
25		−24	827	75	+2	−1
− 30		−37	814	67	+2	−1
35		−46	805	19	−2	−5
− 45	851	−92	= 759	2		

In column A I have exhibited the residual errors of the empirical solution

$$865' \mp 165' \sin^{\frac{7}{4}} l \qquad \text{A}$$

and in column B, those of the expression

$$865' \mp 165' \sin^{\frac{7}{4}} (l - 1^\circ) \qquad \text{B}$$

The errors are on the whole reduced by the additional assumption that the Equator of equal parallel rotation differs by 1 degree from the true Equator, and the solution is probably as good numerically as it is possible to find one, and very closely represents the total results of observation

Respecting expression A, in which it is assumed that the motions are equal at equal distances from the Equator North or South, it has further to be remarked that the assumed constant 865′ requires no sensible correction, the sum of the + errors multiplied by their weights being sensibly equal to that of the − errors similarly multiplied by their respective weights

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In the last place, as the results for motion in longitude are sufficiently numerous, I have thought it desirable to divide the whole into two portions, and to institute for each hemisphere a comparison of the motions of groups before number 400 with those after The mean difference for each hemisphere has been calculated by the following formula *

If a_1 be the mean motion and m_1 its weight for groups before 400 of any one degree of latitude, b_1 the mean motion and n_1 the weight for the groups after 400 of the same degree of latitude, the weight of $(b_1 - a_1)$ the difference between the mean motions before and after 400 of that degree is $\frac{m_1\ n_1}{m_1 + n_1}$, and the mean difference for all the observed latitudes is

$$\frac{(b_1 - a_1)\ \frac{m_1\ n_1}{m_1 + n_1} + (b_2 - a_2)\ \frac{m_2\ n_2}{m_2 + n_2} + \text{etc}}{\frac{m_1\ n_1}{m_1 + n_1} + \frac{m_2\ n_2}{m_2 + n_2} + \text{etc}}$$

with weight the same as the denominator

In this manner I have found for the North Hemisphere the difference + 0′ 94 with weight 114, and for the South Hemisphere the mean difference −2′ 7 with weight 92 and therefore for the two combined — 0′ 7 with weight 207 The quantity is too small to be regarded as anything but a necessary conclusion of a numerical process, and the signs come out opposed for the two hemispheres Still I state the result of the examination, such as it is

* For which I am indebted to Prof De Morgan.

SECTION IV.

Investigation of the Corrections required by the assumed Elements of Position of the Sun's Pole

Having no doubt from the commencement of this work that the elements adopted for provisional use, namely,

$$I = 7^\circ\ 10', \qquad \text{and } N = 74^\circ\ 30', \qquad \text{for } 1854.0,$$

were very nearly correct, I have never contemplated the necessity of starting anew with every satisfactory series of observations as a fresh basis for founding a set of elements upon, but I have throughout expected that a proper treatment of a large number of series carefully selected from the stock, would lead me by a suitable differential method to a final correction of the elements on which some considerable reliance might be placed

It is not easy to assure oneself, in examining the grounds on which previous elements rest, that the precaution has been taken of rejecting as unsuitable data spots of abnormal form, changing figure, or the components of groups The frequent instances given in preceding pages of this work of the mutual action of parts of groups, whether large or small, and inspection of the plates of illustration, will supersede the necessity of specially pointing out why in selecting data for the correction of the assumed position of the Pole, it is indispensable to exercise a certain discrimination, and as nearly as possible confine oneself to continuous series of small well-defined single circular nuclear spots, such as Nos 180, 194, 207, 291, 478, &c If single dots, such as No 59, without penumbra, were frequent and of sufficient duration, they would be still preferable as offering more definite centres for observation, but these objects rarely remain visible for more than two or three days, and the same consideration induces one to include some normal spots of larger size than a fastidious choice would approve, because they have the advantage of greater permanence over the very small ones In endeavouring on the one hand to retain all admissible data, and to reject all groups affected by internal mutual actions, I find the following 86 series of observations alone remain out of the whole number observed The numbers are recopied here, partly for convenience of reference, partly because a reader could not without reference to my original memoranda

in all cases select the proper spot, partly because the longitudes from the Node are here required as data, and partly because in a few cases a small correction has been made in the latitude for an estimated amount (indicated by an asterisk) of observed change of form

Group	Day	Longitude	Latitude	Group	Day	Longitude	Latitude
		° ′	° ′			° ′	° ′
32	94 55	74 55	+17 47	59	236 51	189 24	−10 14
	95 57	88 37	+18 13		237 53	203 23	−10 20
	97 51	115 18	+18 20		238 56	218 10	−10 3
					239 53	231 56	−10 13
38	121 57	91 44	+19 10		240 53	246 19	−10 23
	123 54	119 34	+19 8		241 52	260 29	−10 23
	128 55	188 28	+19 41		242 55	275 6	−10 19
					243 52	288 54	−10 8
50	172 59	142 10	+10 45				
	173 52	155 34	+10 23	66	269 54	231 41	+10 26
	174 53	169 33	+10 23*		270 56	246 12	+10 24
	175 54	184 4	+10 26		271 55	260 26	+10 13
	176 51	197 46	+10 24		272 56	274. 48	+10 14
	177 52	212 21	+10 22		273 52	288 29	+10 11
	178 54	226 54	+10 17		274 51	302 44	+10 28
	179 54	241 50	+10 8				
	180 56	256 22	+10 16	69	303 48	268 9	+ 7 48
					304 51	282 54	+ 7 47
51	172 59	129 48	−14 28		306 49	311 16	+ 8 4
	173 52	143 18	−14 43		309 52	354. 41	+ 8 45
	174 53	157 26	−14 52		312 48	37 0	+ 9 6
	175 54	171 27	−14 56				
	176 51	185 15	−14 39	86	64 52	11 58	9 9
	177 52	199 26	−14 40		65 49	25 40	− 9 0
	178 53	213 23	−14 42*		70 53	97 7	− 9 21
	179 54	228 23	−14. 25		71 53	111 19	− 9 21
	180 56	241 32	−14. 13		74 50	154. 7	− 9 4
	182 56	269 17	−13 41				
				107	296 56	262 37	+ 8 0
57	209 57	164. 42	−11 40		299 54	305 50	+ 7 22
	210 52	178 37	−11 30		300 54	320 9	+ 7 4
	212 50	207 2	−11 12		304 51	16 55	+ 7 0
	213 55	221 42	−11 5				
	217 59	278 46	−10 56	113	100 57	64 5	−11 21
	218 52	292 3	−10 42		106 46	148 39	−12 23
	219 53	305 34	−10 26		107 51	163 26	−12 19
					108 51	177 48	−12 30
58	219 53	162 30	+ 6 32		109 64	193 44	−12 19
	221 50	190 43	+ 6 33		110 53	206 14	−12 19
	222 54	205 39	+ 6 25				
	224 52	234. 3	+ 6 3	140	42 51	5 35	−28 0
	225 49	247 51	+ 6 9		45 52	48 3	−27 45
	227 57	277 16	+ 5 48		46 51	62 10	−27 51
	229 61	306 15	+ 5 50		47 58	77 7	−27 54
	230 47	318 25	+ 5 50				
	231 50	333 44	+ 5 49	157	145 52	89 56	−21 41

Group	Day	Longitude	Latitude
		° ′	° ′
	146 50	103 26	−21 25
	147 54	117 58	−21 26
	149 51	145 44	−21 29
	151 50	173 21	−21 49
	152 67	189 15	−21 53
	153 58	202 12	−21 50
	154 51	214 42	−21 49
	155 51	228 35	−21 36
	157 66	257 31	−21 11
161	173 52	121 29	−21 19
	174 53	134 35	−21 28
	175 53	148 23	−21 52
	176 42	160 35	−21 53
	177 65	176 48	−22 3
	178 51	188 41	−22 6
	179 67	204 40	−22 17
170	223 66	188 27	−20 9
	224 56	201 12	−20 15
	225 58	215 0	−20 36
	227 49	241 27	−20 31
	228 45	255 7	−20 42
	229 49	269 40	−20 33
	230 53	283 53	−20 24
171	223 66	186 18	+27 29
	224 56	198 28	+27 31
	225 58	212 19	+27 40
	227 49	238 51	+28 18
	228 45	251 57	+28 21
	229 49	266 19	+28 29
	230 53	280 22	+28 23
173	233 50	177 23	−28 59
	234 50	191 55	−28 38
	235 46	204 39	−28 31
	236 53	219 7	−28 44
	237 51	232 41	−28 56
	238 55	247 25	−29 8
	239 51	259 52	−29 4
	241 50	286 50	−28 38
	242 50	300 15	−28 17
	243 51	313 54	−27 57
	244 57	328 12	−27 50
180	252 45	223 11	−26 31
	255 52	264 46	−26 51
	256 67	280 18	−26 27
	258 50	305 5	−26 34
	259 49	318 28	−26 41
	260 41	330 39	−26 44

Group	Day	Longitude	Latitude
		° ′	° ′
187	274 48	210 56	+18 59
	277 51	252 3	+18 57
	278 45	265 2	+19 0
	282 47	321 38	+18 47
	285 50	3 34	+19 18
	286 47	17 18	+19 29
189	277 51	216 0	+21 27
	278 45	229 27	+21 20
	282 47	285 2	+21 2
	285 50	326 19	+20 57
	286 47	339 51	+21 21
	288 51	11 37	+21 25
194	288 51	245 43	+25 35
	289 50	259 13	+25 49
	291 59	288 11	+25 53
	292 57	302 14	+26 0
	295 55	344 17	+26 12
	296 48	357 30	+26 29
	298 47	25 7	+26 45
207	322 62	273 26	−16 17
	325 62	315 51	−17 0
	328 50	356 30	−17 0
	330 51	24 37	−16 51
	331 51	38 35	−16 59
208	337 49	333 7	−17 5
	338 51	347 30	−16 42
	341 49	29 26	−16 41
209	337 49	323 0	+29 29
	338 51	336 56	+29 51
	341 49	17 38	+29 45
267	129 50	83 32	−20 8
	132 52	127 48	−19 29
	135 58	171 47	−19 25
	137 63	200 46	−19 25
281	162 51	125 42	− 9 51
	163 52	140 6	− 9 32
	164 52	154 7	− 9 31
	165 52	168 19	− 9 17
	166 53	182 42	− 8 57
	169 53	225 43	− 8 48
	171 57	254 17	− 8 54
	172 54	267 55	− 8 51
291	176 55	129 28	−13 44
	177 62	143 27	−13 47
	179 51	170 2	−14 13

Group	Day	Longitude.	Latitude	Group	Day	Longitude.	Latitude
		° ′	° ′			° ′	° ′
	180 61	185 42	−14 9		327 54	348 44	+14 16
	181 66	200 16	−14 10		330 48	30 15	+14 24
	182 68	214 47	−14 6				
	184 53	241 4	−13 48	592	344 52	329 53	+25 24
	186 49	268 24	−14 2		348 55	26 40	+24 43
					351 52	68 36	+24 17
296	188 65	153 30	−19 35				
	191 48	195 8	−19 32	597	348 55	314 29	−16 19
	192 55	209 37	−19 33		351 52	355 35	−15 56
	194 51	236 25	−19 41		355 49	51 23	−15 24
	195 52	250 32	−19 55				
	197 52	278 41	−20 8	598	348 55	291 17	+21 36
					351 52	331 29	+22 6
297	188 65	139 52	− 9 52		355 49	26 30	+22 2
	191 48	179 42	− 9 42		360 54	94 18	+22 5
	192 55	194 58	− 9 54				
	194 51	223 8	− 9 45	612	6 47	326 52	+10 16
	195 52	237 21	−10 0		10 46	22 50	+10 40
	197 52	265 56	− 9 49		15 48	94 50	+10 51
					16 48	109 36	+11 9
408	61 68	64 47	+13 45				
	64 51	105 7	+13 10	619	15 48	336 6	−24 24
	66 52	133 6	+12 58		16 48	350 32	−24 23
	67 49	146 4	+12 37		18 55	18 42	−24 43
	68 63	162 51	+13 3		21 46	58 22	−25 1
					22 50	72 34	−25 10
440	124 48	95 1	−14 9		23 47	86 5	−25 16
	127 51	137 41	−14 1				
	131 54	194 20	−13 46	632	29 59	8 13	+17 56
					31 50	36 8	+18 13
453	145 54	106 2	+30 38		32 50	50 44	+18 22
	155 65	243 23	+29 58				
				650	50 43	354 11	−24 5
478	173 60	133 1	+30 9		52 58	24 23	−24 1
	176 56	173 23	+29 30		53 54	37 46	−23 54
	180 51	226 53	+28 33		54 49	50 24	−24 7
	183 53	267 12	+28 36		57 50	92 2	−24 17
					59 50	118 50	−24 59
459	155 65	127 49	−12 37		60 58	134 29	−24 27
	159 56	183 26	−12 42		61 64	149 43	−24 35
	162 52	225 33	−12 32				
				653	57 50	23 9	− 6 47
486	187 54	148 20	+10 7		59 50	50 58	− 6 57
	188 55	161 59	+10 12		60 58	66 52	− 6 51
	190 60	190 30	+10 0		61 64	81 22	− 7 5
	197 55	288 35	+10 57		64 44	121 24	− 6 29
					65 46	136 6	− 6 19
575	316 54	271 31	−28 26		67 62	165 57	− 6 28
	320 46	324 3	−28 15*				
	323 51	5 34	−27 52	677A	83 57	36 16	− 6 25
	327 54	60 19	−27 59		84 47	48 52	− 6 28
					85 45	62 58	− 6 37
582	323 51	291 42	+14 1				

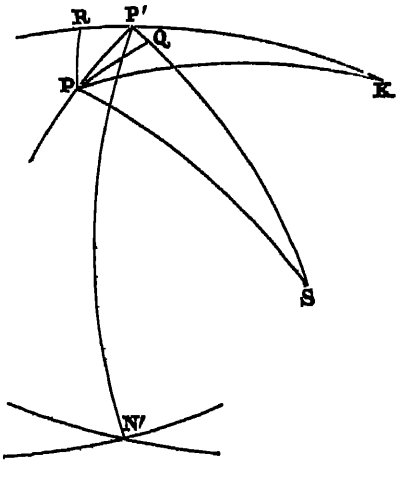
Group	Day	Longitude	Latitude	Group	Day	Longitude	Latitude
		° ′	° ′			° ′	° ′
658	64 44	28 42	+18 29	770	198 55	164 38	+17 13
	65 46	43 6	+18 50		199 65	180 16	+17 17
	67 62	73 54	+18 57		200 53	192 13	+17 5
	69 52	101 4	+18 57		201 56	206 45	+17 2
	72 45	141 58	+18 26		203 49	233 42	+16 58
	74 49	170 40	+18 32		205 63	263 58	+16 53
					206 64	278 13	+16 48
709	122 53	81 47	+15 52				
	123 66	96 55	+15 36	775	201 56	140 5	+10 51
	124 50	109 8	+15 21		203 49	167 50	+10 45
	125 49	122 33	+15 6		205 63	197 40	+10 58
	126 55	137 56	+15 14		206 64	212 1	+10 58
	127 49	151 9	+14 47		211 55	281 25	+11 18
					213 66	311 11	+11 28
720	140 45	119 3	+15 19				
	141 46	133 34	+15 9	777 *a*	203 49	158 32	−15 42
	142 45	147 14	+14 51		205 63	187 45	−15 42
	143 56	163 1	+15 11		206 64	202 21	−15 39
	144 58	177 24	+15 32		211 55	272 11	−14 47
					213 66	302 14	−14 21
725	142 45	86 46	+ 7 58				
	143 56	100 56	+ 7 55	777 *b*	205 63	177 21	−16 51
	144 58	116 5	+ 8 14		206 64	192 8	−17 25
	147 50	158 16	+ 7 44		211 55	261 16	−17 32
	150 38	199 22	+ 7 47		213 66	290 57	−17 0
730	150 38	112 28	−12 36 ?	787	219 63	207 46	+ 7 39
	156 36	196 2	−12 29		221 55	235 11	+ 7 48
	157 55	212 22	−12 47		222 59	249 36	+ 7 49
	159 53	239 55	−12 48		223 52	262 35	+ 7 48
					226 49	304 39	+ 7 51
753	176 62	121 34	−13 4				
	177 34	133 19	−12 46	789	219 63	177 9	+19 13
	182 58	206 48	−12 15		221 55	204 9	+19 27
	184 56	234 30	−12 31		222 59	218 9	+19 27
	185 53	248 11	−12 26		223 52	231 32	+19 29
	187 72	278 56	−12 13		226 49	272 55	+19 5
					229 49	314 59	+19 1
747	173 50	156 48	+11 54				
	176 62	203 2	+11 27	792	221 55	173 30	+14 6
	177 34	213 42	+11 33		222 59	188 4	+14 9
					223 52	201 32	+14 2
749	173 50	136 17	−15 0		226 49	242 38	+13 58
	176 62	180 4	−15 28		229 49	284 11	+14 19
	177 34	190 32	−15 19		232 48	326 7	+14 38
760	185 53	135 25	−22 12	797	229 49	200 34	+31 23
	187 72	165 49	−22 12		232 48	240 13	+31 42
	189 58	192 14	−22 15		233 52	254 8	+31 20
	190 54	205 9	−22 32		238 51	321 15	+31 11
	192 63	234 11	−22 28		239 52	335 38	+31 15
	193 71	249 22	−22 29				
	194 48	259 28	−22 37	799	229 49	170 50	+24 18

Group	Day	Longitude	Latitude
		° ′	° ′
	232 48	213 9	+24. 28
	233 52	227 46	+24 28
	238 51	297 56	+24. 44
	239 52	312 23	+24. 45
	240 57	327 30	+24. 33
807	239 52	178 58	−18 35
	240 57	193 21	−18 42
	241 57	207 25	−18 43
	242 67	223 2	−18 32
	243 53	235 18	−18 28
	244 56	249 42	−18 19
	245 45	261 58	−18 24
	246 50	276 48	−18 24
	247 53	290 59	−18 14
	248 48	304. 15	−18 16
	250 56	333 27	−18 24
808	240 57	183 23	+14 49
	241 57	197 53	+14 50
	242 67	213 29	+15 1
	243 53	226 8	+14 56
	244 56	241 5	+15 5
	245 45	253 55	+14 57
	246 50	269 5	+14 50
	248 48	291 29	+15 42
811	245 45	225 52	−11 7
	246 50	242 25	−10 42
	247 53	257 43	−10 41
	248 48	271 44	−10 50
	250 56	301 7	−10 26
834	273 44	269 50	−11 45
	275 45	297 47	−11 31
	276 51	313 8	−11 50
	277 46	326 3	−11 53
	279 53	355 18	−12 22
814	246 50	186 43	+14. 22
	247 53	201 11	+14 21
	248 48	215 16	+14 18
	250 56	244. 26	+14 24
	254 42	299 53	+15 32
	255 42	314 20	+14 56
	256 46	329 13	+15 2
	257 44	343 29	+14 56
	258 49	357 34	+15 21
815	248 48	192 35	+15 12
	250 56	221 9	+14 53
	254 42	275 49	+14 54
	255 42	289 8	+14. 47
	256 46	303 42	+14 56
	257 44	318 1	+14 36
	258 49	332 34	+15 14
830	264 45	234. 33	− 8 22
	267 45	276 33	− 8 10
	273 44	3 31	− 8 7
839	275 45	215 43	+15 7
	276 51	229 26	+15 1
	277 46	241 26	+14. 55
	279 53	270 27	+14 55
	281 40	296 17	+14 39
	282 60	312 49	+14. 40
840	276 51	214. 39	+22 14
	277 46	223 37	+21 50
	279 53	252 48	+21 25
	281 40	278 54	+21 10
	282 60	295 23	+21 23
	285 51	335 48	+21 36
	287 64	5 22	+21 52
	289 66	33 12	+22 7
851	295 45	253 36	− 9 26
	297 59	284 28	− 9 21
	301 45	341 18	− 8 53
	302 45	356 7	− 9 14
867	315 59	259 57	− 7 56
	319 52	315 7	− 8 5
	320 52	328 57	− 7 52
	322 48	357 7	− 8 25
	323 46	10 45	− 8 35
	326 48	52 53	− 9 7
871	322 48	267 24	−20 59
	323 46	280 57	−21 1
	326 48	322 22	−20 41
	331 40	30 11	−20 1
	332 58	46 55	−20 20
872	326 48	282 4	− 9 44
	331 40	352 30	− 9 34
	332 58	8 58	− 9 46
	335 52	49 43	− 9. 41
	336 54	64 29	− 9 54
873a	326 48	271 23	−26 17
	331 40	339 3	−25 8
	332 58	355 52	−25 4
	335 52	37 4	−24 39

Group	Day	Longitude	Latitude	Group	Day	Longitude	Latitude
		° ′	° ′			° ′	° ′
873b	331 40	330 38	−20 17		352 50	39 39	+ 7 9
	332 58	347 6	−20 22		353 51	54 0	+ 7 16
	335 52	27 56	−20 13		354 50	67 47	+ 7 20
	336 54	42 36	−20 17	903	1 54	33 36	+ 5 43
884	336 54	278 0	+25 8		2 53	47 43	+ 5 40
	343 50	13 35	+25 39		3 58	63 2	+ 5 54
	344 48	27 17	+25 37		5 49	89 42	+ 5 16
					6 60	104 44	+ 5 18
889	343 50	289 39	+10 49				
	344 48	304 13	+10 44	949	73 48	20 58	−12 1
	349 49	16 5	+10 55		76 45	61 36	−12 35
	351 60	45 39	+10 52		79 45	104 37	−12 38
	352 50	58 11	+10 56		80 44	118 36	−12 5
	353 51	72 34	+10 54		81 62	135 34	−11 46
	354 50	85 59	+10 49		82 42	146 39	−11 41
890	344 48	283 46	+ 7 30	950	76 45	59 23	+ 6 54
	349 49	356 16	+ 7 18		79 45	102 14	+ 6 30
	351 60	26 36	+ 6 58		80 44	116 33	+ 6 44

It does not require much consideration to see that the effect of a moderate error of position of the Pole as assumed in the reduction, will chiefly be felt in the latitudes, while the deduced longitudes will be affected by a very small and nearly constant amount, and consequently that the inequality produced in the North Polar Distances will be the best foundation for the desired corrections If a circle be drawn on paper representing any true parallel of latitude, the centre being the true pole, and any position of the false pole be assumed, the general value of the inequality is at once seen, and the relative position of the longitude at which the inequality vanishes or becomes a maximum But the exact relations are found as follows

Let K be the pole of the Ecliptic
P Sun's true Pole
P′ assumed Pole
N′ assumed Node
(and $N'P'K=90°$)
$PK=I$, $P'K=I'$, and $PKP'=N-N'$



Let S be a Solar Spot
$PS=\delta$, $P'S=\delta'$,
then
$\delta'-\delta=P'Q=PP'\cos(PP'N+NP'S)$
$=PP'\cos PP'N'\cos\alpha'-PP'\sin PP'N'\sin\alpha'$
$=X\cos\alpha'-Y\sin\alpha'$ suppose

where a' is the computed longitude of the Spot from the assumed node, as given in my principal catalogue of positions, and extracted in the series recopied above from it

If X and Y can be found from a series, or from many combined series of observations, the inequality is readily found from the relations

$$PP' = \sqrt{X^2 + Y^2}, \qquad \tan PP'N' = \frac{Y}{X}$$

and inasmuch as

$$X = PP' \cos PP'N' = PR = (N - N') \sin I,$$
$$Y = PP' \sin PP'N' = P'R = (I - I'),$$

the following give the true elements

$$I = I' + Y,$$
$$N = N' + X \operatorname{cosec} I$$

We have to consider next in what way these quantities X and Y can most advantageously be found from the whole of a number of separate series of Spots, affected each by errors of observation and individual proper motions, and at the outset it may be well to recognize that with such data as floating objects visible on a fluid surface but for a few days at a time, the problem can only be defined to be, 'To find that position of Pole which shall the best reduce these motions to parallelism, and, if any systematic drift towards either Pole shall be found, to symmetry with respect to the concluded Equator'

I will first give a specimen of the treatment of a single series of observations Group 50

Let 176 54 be taken as origin of time, $+10° 20' + d$ (a small unknown quantity) the true latitude at this time, and $\frac{\Delta}{10}$ the change of latitude in one day caused by proper motion, necessarily supposed uniform throughout the observations in the absence of knowledge to the contrary, or of any law of variation The true latitude at any other time will be $+10° 20' + d - \frac{\Delta}{10} (t - 176\ 54)$, and by our formula this is

$$= D' + (X \cos a' - Y \sin a')$$

We can therefore from the formula

$$X \cos a' - Y \sin a' = d + (10° 20' - D') + \frac{\Delta}{10} (176\ 54 - t)$$

form an equation of condition from each observation

Thus, from series 50, we have the following

$$\begin{aligned} -\ 792\ X - 612\ Y &= d - 0' + 395\ \Delta \\ -\ 911\ X - 414\ Y &= d + 7 + 302\ \Delta \\ -\ 980\ X - 182\ Y &= d + 7 + 201\ \Delta \\ -\ 996\ X + 071\ Y &= d - 6 + 100\ \Delta \end{aligned}$$

$$
\begin{aligned}
-\ 955\ X + \ 305\ Y &= d - \ 4 + \ 003\ \Delta \\
-\ 844\ X + \ 536\ Y &= d - \ 2 - \ 098\ \Delta \\
-\ 685\ X + \ 730\ Y &= d + \ 3 - \ 195\ \Delta \\
-\ 472\ X + \ 880\ Y &= d + 12 - \ 300\ \Delta \\
-\ 236\ X + \ 973\ Y &= d + \ 4 - \ 402\ \Delta
\end{aligned}
$$

Eliminating d by subtraction of the mean of all these equations from each one,

$$
\begin{aligned}
-\ 029\ X - \ 866\ Y &= -\ 2'3 + \ 395\ \Delta \\
-\ 148\ X - \ 668\ Y &= +\ 4\ 7 + \ 302\ \Delta \\
-\ 217\ X - \ 436\ Y &= +\ 4\ 7 + \ 201\ \Delta \\
-\ 233\ X - \ 183\ Y &= -\ 8\ 3 + \ 100\ \Delta \\
-\ 192\ X + \ 051\ Y &= -\ 6\ 3 + \ 003\ \Delta \\
-\ 081\ X + \ 282\ Y &= -\ 4\ 3 - \ 098\ \Delta \\
+\ 078\ X + \ 476\ Y &= +\ 0\ 7 - \ 195\ \Delta \\
+\ 291\ X + \ 626\ Y &= +\ 9\ 7 - \ 300\ \Delta \\
+\ 527\ X + \ 719\ Y &= +\ 1\ 7 - \ 402\ \Delta
\end{aligned}
$$

Retaining Δ on the right hand side and solving these equations by the method of minimum squares, there result

$$
\begin{aligned}
X &= +\ 8'75 - 1\ 035\ \Delta \\
Y &= +\ 4\ 00 - 0\ 488\ \Delta
\end{aligned}
$$

from which we see that if $\Delta = +\ 8'$, or if there is a proper motion of only $0'\ 8$ per diem towards the equator, the signs of the corrections change, and thus is a very small and possible quantity

Take an equidistant South series, No 59. As before, let Δ indicate motion Southwards By precisely similar steps, we shall find from this series,

$$
\begin{aligned}
X &= +\ 2'31 - 0\ 511\ \Delta \\
Y &= +\ 3\ 86 - 0\ 780\ \Delta
\end{aligned}
$$

If, in summing up a number of such results, we simply neglect the effect of Δ, by writing zero for it in each equation, we derive a mean result which for the above will be simply

$$X = +\ 5'53\ ,\quad Y = +\ 3'93$$

If, on the other hand, we assume that the values of Δ depend on the latitude, and in equal latitudes have equal and opposite signs, we should then divide out the co-efficients of Δ, and write our results thus—

$$
\begin{aligned}
+\ 0\ 970\quad X &= +\ 8\ 40 - \Delta_1 \\
+\ 1\ 957\quad X &= +\ 4\ 52 - \Delta_2
\end{aligned}
$$

similarly

$$
\begin{aligned}
+\ 2\ 050\quad Y &= +\ 8\ 20 - \Delta_1 \\
+\ 1\ 265\quad Y &= +\ 4\ 89 - \Delta_2
\end{aligned}
$$

whence adding and writing

$$\Delta_1 + \Delta_2 = 0$$

$$X = +\ 4'41\ ,\quad Y = +\ 3'95$$

The method of procedure, which I have here applied to two series, might be applied

to numerous pairs North and South, but another obstacle will be found to occur, in addition to the great labour of the process, namely, that when a certain number of satisfactory pairs of series have been chosen from out of the 86 at disposal, the others will not pair together in any satisfactory manner, two and two, with due regard to weight, and we seem to require, at the same time, a readier and more general style of treatment

Such is the following, which I finally adopted Each series of observations yields a certain number of observed values of δ' corresponding to observed values of α', from which we can obtain a series of equations

$$\begin{aligned} \delta'_a - \delta &= X \cos a - Y \sin a \\ \delta'_b - \delta &= X \cos b - Y \sin b \\ \delta'_c - \delta &= X \cos c - Y \sin c \end{aligned}$$

from which, by subtraction, we can form the following equations, independent of δ, the actual North Polar Distance,

$$\begin{aligned} \delta'_b - \delta'_a &= X (\cos b - \cos a) - Y (\sin b - \sin a) \\ \delta'_c - \delta'_b &= X (\cos c - \cos b) - Y (\sin c - \sin b) \end{aligned}$$

and determine values of X and Y from the successive differences of δ' as observed In order to determine the values of X and Y, which result from the totality of a large number of series of observations, it is most convenient, however, to interpolate other values of δ' for previously selected values of α' at equal intervals, such as 30 degrees, to tabulate the observed differences of δ' for each series for these angles and to take the mean values of $(\delta'_b - \delta'_a)$, $(\delta'_c - \delta'_b)$, etc as the data for the determination of the values of X and Y The table which follows will render the process perfectly clear, and the only point requiring further explanation is the process of interpolation followed, which it will be seen has the advantage of getting rid in a degree of the inevitable errors of observation Suppose we have a series of observed numbers for *equal* intervals of time, such as the following in the first line below, take their means two and two, as in the second line, and again the means of the first means two and two, as in the third line,

454 , 478 , 490 , 536 , 588 , 614, etc
466 , 484 , 513 , 562 , 601, etc
475 , 498 , 537 , 582, etc

it will be apparent, particularly on laying down these values graphically, that by the substitution of the numbers in the third line for those in the first line, the irregularities of the values (supposed to be observed values) are in a great measure mutually destroyed, while the law of progress is left intact I have applied this process to the observed values of δ' for each series of observations of the spots selected as data for elements, by laying them down graphically, interpolating between them two and two with the observed unequal differences of α', and in the second taking of means found values of δ' correspond-

ing to equal differences of α', namely, at each 30 degrees The trial of any one case will show at once that there is no difficulty in so doing In this manner I have substituted for the original series of observations the following interpolated series, in which the arrangement follows the order of North Polar Distance and North Polar Distances are substituted for latitudes as required by the formula

Spot	α'	δ'	Diff	Spot.	α'	δ'	Diff
797	210°	58° 26′		598	300°	68° 15′	
	240	29	+ 3′		330	4	−11′
	270	37	+ 8		360	67 57	− 7
	300	44	+ 7		30	57	0
	330	58 47	+ 3		60	56	− 1
					90	67 55	− 1
453	150	59 34					
	180	43	+ 9	840	240	68 24	
	210	59 51	+ 8		270	43	+19
					300	39	− 4
209	330	60 21			330	25	−14
	360	60 10	−11		360	12	−13
					30	67 55	−17
478	150	60 7					
	180	38	+31	189	240	68 43	
	210	61 4	+26		270	52	+ 9
	240	20	+16		300	59	+ 7
					330	51	− 8
141	180	62 35			360	68 35	−16
	210	20	−15				
	240	61 46	−34	38	120	70 46	
	270	34	−12		150	37	− 9
					180	70 24	−13
194	240	64 24					
	270	10	−14	789	180	70 45	
	300	2	− 8		210	35	−10
	330	63 50	−12		240	38	+ 3
	360	33	−17		270	49	+11
	30	10	−23		300	70 59	+10
884	300	64 45		187	210	71 1	
	330	36	− 9		240	1	0
	360	28	− 8		270	3	+ 2
	30	64 20	− 8		300	5	+ 2
					330	0	− 5
592	0	64 58			360	70 46	−14
	30	65 20	+22				
	60	65 38	+18	658	30	71 25	
					60	7	−18
799	180	65 40			90	5	− 2
	210	34	− 6		120	20	+15
	240	30	− 4		150	71 30	+10
	270	24	− 6				
	300	18	− 6	632	30	71 52	
	330	65 21	+ 3		60	35	−17

Spot	α'	δ'	Diff	Spot.	α'	δ'	Diff
	°	° ′			°	° ′	
32	90	71 54			120	76 56	+20′
	120	40	−14′		150	77 12	+16
770	180	72 47		747	180	78 20	
	210	59	+12		210	30	+10
	240	73 4	+ 5				
	270	10	+ 6	775	150	79 11	
					180	10	− 1
709	90	74 17			210	1	− 9
	120	47	+30		240	78 55	− 6
	150	75 4	+17		270	45	−10
					300	78 36	− 9
720	120	74 45					
	150	55	+10	889	300	79 15	
	180	74 40	−15		330	12	− 3
					360	10	− 2
815	210	74 59			30	7	− 3
	240	75 5	+ 6		60	6	− 1
	270	9	+ 4		90	79 10	+ 4
	300	11	+ 2				
	330	75 9	− 2	612	330	79 41	
					360	30	−11
839	210	74 54			30	22	− 8
	240	75 3	+ 9		60	14	− 8
	270	10	+ 7		90	79 5	− 9
	300	75 19	+ 9				
				486	150	79 51	
808	180	75 14			180	53	+ 2
	210	4	−10		210	43	−10
	240	0	− 4		240	32	−11
	270	75 3	+ 3		270	79 14	−18
814	180	75 37		50	150	79 26	
	210	40	+ 3		180	35	+ 9
	240	32	− 8		210	38	+ 3
	270	10	−22		240	79 48	+10
	300	4	− 6				
	330	75 1	− 3	66	240	79 35	
	360	74 55	− 6		270	46	+11
					300	79 37	− 9
792	180	75 53					
	210	58	+ 5	69	270	82 14	
	240	57	− 1		300	3	−11
	270	50	− 7		330	81 39	−24
	300	35	−15		360	16	−23
	330	75 22	−13		30	80 58	−18
582	300	75 56		725	120	81 58	
	330	50	− 6		150	82 6	+ 8
	360	43	− 7		180	82 15	+ 9
	30	75 37	− 6				
				787	210	82 20	
408	90	76 36			240	12	− 8

Spot.	α'	δ'	Diff
	270°	82° 11′	− 1′
	300	82 10	− 1
107	270	82 5	
	300	35	(+30)
	330	53	+18
	360	82 60	+ 7
890	300	82 31	
	330	40	+ 9
	360	50	+10
	30	56	+ 6
	60	82 43	−13
950	60	83 10	
	90	20	+10
	120	83 22	+ 2
58	180	83 29	
	210	40	+11
	240	54	+14
	270	84 5	+11
	300	11	+ 6
	330	84 11	0
903	30	84 20	
	60	18	− 2
	90	84 37	+19
677	30	96 22	
	60	33	+11
653	30	96 51	
	60	55	+ 4
	90	52	− 3
	120	31	−21
	150	96 24	− 7
830	240	98 18	
	270	15	− 3
	300	11	− 4
	330	9	− 2
	360	98 8	− 1
867	270	98 4	
	300	0	− 4
	330	2	+ 2
	360	26	+24
	30	98 50	+24
86	30	99 5	
	60	10	+ 5
	90	17	+ 7
	120	99 16	− 1
	150	99 7	− 9
851	270	99 24	
	300	12	−12
	330	6	− 6
	360	99 5	− 1
281	120	99 50	
	150	31	−19
	180	99 5	−26
	210	98 54	−11
	240	52	− 2
	270	98 52	0
872	300	99 40	
	330	40	0
	360	41	+ 1
	30	44	+ 3
	60	99 49	+ 5
297	150	99 48	
	180	49	+ 1
	210	50	+ 1
	240	54	+ 4
	270	99 53	− 1
59	210	100 11	
	240	19	+ 8
	270	100 20	+ 1
811	240	100 50	
	270	45	− 5
	300	100 30	−15
57	180	101 30	
	210	10	−20
	240	3	− 7
	270	100 54	− 9
	300	100 35	−19
834	270	101 45	
	300	40	− 5
	330	102 0	+20
	360	20	+20
113	90	101 40	
	120	102 0	+20
	150	18	+18
	180	25	+ 7
	210	102 16	− 9
949	30	102 13	

Spot	α'	δ'	Diff	Spot	α'	δ'	Diff
	60°	102° 27′	+14′	207	300°	106° 41′	
	90	33	+ 6		330	57	+16′
	120	102 9	−24		360	57	0
	150	101 38	−31		30	106 55	− 2
459	150	102 40		777b	180	107 7	
	180	38	− 2		210	20	+13
	210	102 36	− 2		240	25	+ 5
					270	107 18	− 7
730	150	102 32					
	180	32	+ 0	807	180	108 38	
	210	41	+ 9		210	40	+ 2
	240	102 48	+ 7		240	25	−15
					270	24	− 1
753	120	102 60			300	16	− 8
	150	44	−16		330	108 23	+ 7
	180	30	−14				
	210	26	− 4	267	90	109 57	
	240	29	+ 3		120	41	−16
	270	102 20	− 9		150	28	−13
					180	109 26	− 2
440	120	104 5					
	150	103 58	− 7	296	180	109 34	
	180	103 50	− 8		210	35	+ 1
					240	47	+12
291	150	103 55			270	110 5	+18
	180	104 10	+15				
	210	104 7	− 3	873b	330	110 20	
	240	103 56	−11		360	18	− 2
	270	103 55	− 1		30	110 15	− 3
51	150	104 47		170	180	110 14	
	180	46	− 1		210	27	+13
	210	40	− 6		240	36	+ 9
	240	15	−25		270	110 35	− 1
	270	103 45	−30				
				871	270	110 60	
777a	180	105 42			300	51	− 9
	210	31	−11		330	36	−15
	240	11	−20		360	20	−16
	270	104 50	−21		30	110 14	− 6
	300	25	−25				
				157	90	111 38	
749	150	105 11			120	26	−12
	180	22	+11		150	35	+ 9
					180	51	+16
597	330	106 10			210	49	− 2
	360	105 54	−16		240	111 27	−22
	30	37	−17				
				161	120	111 20	
208	330	106 59			150	50	+30
	360	46	−13		180	112 4	+14
	30	106 37	− 9		210	20	+16

Spot.	α'	δ'	Diff	Spot	α'	δ'	Diff
760	150°	112° 12′		180	240°	116° 40′	
	180	14	+ 2′		270	40	0′
	210	27	+13		300	34	− 6
	240	112 30	+ 3		330	116 43	+ 9
650	0	114 6		140	0	117 57	
	30	113 58	− 8		30	52	− 5
	60	114 8	+10		60	117 49	− 3
	90	28	+20				
	120	41	+13	575	270	118 26	
	150	114 30	−11		300	20	− 6
					330	9	−11
619	0	114 32			360	1	− 8
	30	48	+16		30	117 55	− 6
	60	115 2	+14		60	117 57	+ 2
	90	18	+16				
				173	180	118 55	
873a	270	116 14			210	37	−18
	300	115 48	−26		240	62	+25
	330	23	−25		270	54	− 8
	360	0	−23		300	118 20	−34
	30	114 44	−16		330	117 50	−30

The differences of δ' thus found from each series of observations can now be readily combined by tabulating them as follows, and forming mean values

TABLE

	δ'	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°	
1	58° 35′								+ 3	+ 8	+ 7	+ 3			797*
2	59 42						+ 9	+ 8							453
3	60 16												−11		209
4	60 44						+31	+26	+16						478*
5	62 5							−15	−34	−12					171*
6	63 47	−23								−14	− 8	−12	−17		194*
7	64 33	− 8										− 9	− 8		884
8	65 18	+22	+18												592
9	65 29							− 6	− 4	− 6	− 6	+ 3			799*
10	68 5	0	− 1	− 1								−11	− 7		598*
11	68 19	−17							+24	+19	− 4	−14	−13		840*
12	68 47									+ 9	+ 7	− 8	−16		189*
13	70 35						− 9	−13							38
14	70 47							−10	+ 3	+11	+10				789*
15	70 55								0	+ 2	+ 2	− 5	−14		187*
16	71 18		−18	− 2	+15	+10									658*
17	71 46		−17												632
18	71 47				−14										32
Sums		−26	−18	− 3	+ 1	+ 1	+27	+ 3	+ 8	+17	+ 8	−53	−86		

	δ	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°	
Continued		−26	−18	− 3	+ 1	+ 1	+27	+ 3	+ 8	+17	+ 8	−53	−86		
19	72 59							+12	+ 5	+ 6					770*
20	74 40				+30	+17									709*
21	74 45					+10	−15								720
22	75 5								+ 6	+ 4	+ 2	− 2			815*
23	75 7								+ 9	+ 7	+ 9				839*
24	75 7							−10	− 4	+ 3					808*
25	75 18							+ 3	− 8	−22	− 6	− 3	− 6		814
26	75 40							+ 5	− 1	− 7	−15	−13			792
27	75 47	− 6										− 6	− 7		582
28	76 54				+20	+16									408
29	78 25							+10							747
30	78 53						− 1	− 9	− 6	−10	− 9				775
31	79 10	− 3	− 1	+ 4								− 3	− 2		889
32	79 23	− 8	− 8	− 9									−11		612
33	79 34						+ 2	−10	−11	−18					486
34	79 37						+ 9	+ 3	+10						50
35	79 40									+11	− 9				66
36	81 36	−18									−11	−24	−23		69
37	82 8						+ 8	+ 9							725*
38	82 15								− 8	− 1	− 1				787*
39	82 32											+18	+ 7		107
40	82 44	+ 6	−13									+ 9	+10		890*
41	83 16			+10	+ 2										950
42	83 50							+11	+14	+11	+ 6	0			58*
43	84 28		− 2	+19											903
44	96 28		+11												677
45	96 40		+ 4	− 3	−21	− 7									653
46	98 13									− 3	− 4	− 2	− 1		830
47	98 25	+24									− 4	+ 2	+24		867*
48	99 11		+ 5	+ 7	− 1	− 9									86*
49	99 15										−12	− 6	− 1		851*
50	99 21					−19	−26	−11	− 2	0					281*
51	99 45	+ 3	+ 5									0	+ 1		872*
52	99 51						+ 1	+ 1	+ 4	− 1					297*
53	100 15								+ 8	+ 1					59*
54	100 40									− 5	−15				811
55	101 3							−20	− 7	− 9	−19				57*
56	102 0										− 5	+20	+20		834*
57	102 3				+20	+18	+ 7	− 9							113*
58	102 7		+14	+ 6	−24	−31									949
59	102 38						− 2	− 2							459
60	102 40						0	+ 9	+ 7						730
61	102 40					−16	−14	− 4	+ 3	− 9					753*
62	103 58					− 7	− 8								440
63	104 3						+15	− 3	−11	− 1					291*
64	104 16						− 1	− 6	−25	−30					51*
65	105 4							−11	−20	−21	−25				777a*
66	105 17						+11								749*
67	105 54	−17												−16	597*
68	106 48	− 9												−13	208
Sums		−54	− 3	+31	+27	−19	+14	−38	−29	−77	−110	−63	−104		

	δ	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°	
Continued		−54	− 3	+31	+27	−19	+14	−38	−29	−77	−110	−63	−104		
69	106 49	− 2										+16	0		207*
70	107 16							+13	+ 5	− 7					777b*
71	108 28							+ 2	−15	− 1	− 8	+ 7			807*
72	109 42				−16	−13	− 2								267
73	109 50							+ 1	+12	+18					296*
74	110 18	− 3											− 2		873b
75	110 32							+13	+ 9	− 1					170*
76	110 37	− 6									− 9	−15	−16		871*
77	111 39				−12	+ 9	+16	− 2	−22						157*
78	111 50					+30	+14	+16							161*
79	112 21						+ 2	+13	+ 3						760
80	114 20	− 8	+10	+20	+13	−11									650*
81	114 55	+16	+14	+16											619*
82	115 29	−16									−26	−25	−23		873a*
83	116 39										0	− 6	+ 9		180*
84	117 51	− 5	− 3												140
85	118 14	− 6	+ 2								− 6	−11	− 8		575*
86	118 26							−18	+25	− 8	−34	−30			173*
Total Sums		−84	+20	+67	+12	− 4	+44	0	−12	−76	−199	−112	−153		
Nos		22	17	11	12	19	22	32	34	35	29	29	26		
Means		−3 8	+1 2	+6 1	+1 0	−0 2	+2 0	0 0	−0 4	−2 2	−6 9	−3 9	−5 9		
Weights		47	41	33	35	44	47	57	58	59	54	54	51		

On multiplying each of these mean values by its weight, summing the whole, and dividing by the sum of the weights, we find a mean excess of −1′ 5, which would imply that on the whole there is an average tendency towards the North Pole of 90 seconds in the time during which the Sun rotates through 30 degrees I can only regard this as a fictitious and non-real result arising from the omission of some small correction whereby the angles of position come out too great in the first half of any Spot's passage over the disk, and too small in the second half The omission of θ, the correction for non-verticality of the bars, will not account for the result If the correction to the angle of position had been

$$-\theta\left(\tfrac{1}{2}+\sin^2\alpha'\right) \text{ instead of } +\theta\left(\tfrac{1}{2}-\sin^2\alpha'\right)$$

the discrepancy would have been immediately explained, but the correction given in the text is plainly correct on general considerations as well as in its detailed proof It is possible that the omission of the correction for refraction may be the cause, in conjunction with the circumstance that for the most part the observations were made after noon However this may be, for I cannot now introduce this correction, inasmuch as in our present inquiry we are only concerned with that part of the mean differences which follows the law of the sine, and presents an equal departure on the whole on either side of zero,

we must deduct this quantity —1′ 5 from our previously determined results before seeking the values of X and Y

Our data thus become

	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
Diff	−2′3	+2′7	+7′6	+2′5	+1′3	+3′5	+1′5	+1′1	−0′7	−5′4	−2′4	−4′4	
Wts	47	41	33	35	44	47	57	58	59	54	54	51	

and give the following equations of condition

$$
\begin{aligned}
(-134\ X - 500\ Y = -2\,3) \times 47\\
(-366\ X - 366\ Y = +2\,7) \times 41\\
(-500\ X - 134\ Y = +7\,6) \times 33\\
(-500\ X + 134\ Y = +2\,5) \times 35\\
(-366\ X + 366\ Y = +1\,3) \times 44\\
(-134\ X + 500\ Y = +3\,5) \times 47\\
(+134\ X + 500\ Y = +1\,5) \times 57\\
(+366\ X + 366\ Y = +1\,1) \times 58\\
(+500\ X + 134\ Y = -0\,7) \times 59\\
(+500\ X - 134\ Y = -5\,4) \times 54\\
(+366\ X - 366\ Y = -2\,4) \times 54\\
(+134\ X - 500\ Y = -4\,4) \times 51
\end{aligned}
$$

which, when solved by the method of least squares, give the values

$$X = -5′24 \qquad Y = +4′52$$

and therefore

$$\delta' - \delta = 6′9 \cos(\alpha' + 139^\circ\ 10′)$$

for the inequality in the value of δ', as deduced from observation by the assumed elements

$$I = 7^\circ\ 10′ \quad \text{and} \quad N = 74^\circ\ 30′ \quad \text{for} \quad 1854{\cdot}0$$

and therefore as the true elements

$$I = 7^\circ\ 14′5 \quad \text{and} \quad N = 73^\circ\ 49′ \quad \text{for} \quad 1854{\cdot}0$$

As a check on this result, I have next made a further selection of 60 of the best series, namely, those marked in the above table with an asterisk after the group-number, and have submitted them to similar treatment On summing the differences multiplied by their weights it is found, as in the case of the whole, that there is again a mean excess of motion towards the North of 0′ 9 for 30 degrees of rotation I deduct this amount as before, on the same grounds, and then find the following data,

	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
Diff	−3′9	+0′4	+5′9	+13′0	+5′7	+6′4	−0′2	+0′5	−0′7	−5′8	−3′7	−5′5	
Wts	41	32	26	2′6	33	36	51	56	57	52	51	45	

from which, by similar treatment as in the former case, I find

$$X = - 7'87 \quad \text{and} \quad Y = + 7'33$$

the corresponding inequality

$$\delta' - \delta = 10'7 \cos (\alpha' + 137^\circ 2')$$

and for true elements

$$I = 7^\circ 17'3 \ , \quad N = 73^\circ 28' \quad \text{for} \quad 1854\,0$$

It is desirable to point out, what inspection will otherwise show, that the distribution of the series of spots selected as data, is in each case very uniform In the case of all 86 groups, 21 series have greater N latitude than 15 degrees, 22 series lie between 15° North and the equator, 22 other series between the equator and 15° South, and 21 series have greater South latitude than 15 degrees In the case of the 60 series of superior character, 30 are N series and 30 South

I flatter myself that this method of treatment will be considered at the same time convenient and accurate in principle, and that the result arrived at will be held to have superior weight as an astronomical determination to those of the same elements by my predecessors in this line of inquiry The elements of M Laugier were based, as stated in the Comptes Rendus for 1842, Deuxieme Cahier, page 940, on 20 series of observations made and discussed by himself, and are as follows,

$$I = 7^\circ 9' \ , \quad N = 75^\circ 8' \quad \text{for} \quad 1840\,0$$

It is to be regretted that his Memoir, though recommended for publication in the Journal des Savans Etrangers, has never been printed, and that its future publication remains still uncertain, perhaps I should say now improbable, for I believe his determinations to be the best previous to my own, and they will be found to lie between my values and the only others which can be placed in competition with the two, I mean those of Dr Bohm The Elements of Dr Bohm are given in his elaborate Memoir, Aus dem III. Bande der Denkschriften der Math Classe, &c &c der Kaiserlichen Akademie zu Wien, 1852, and are I = 6 56 7 , N = 76 46 9 for 1833 0 and depend on 13 series of observations, which the reader can refer to if he thinks desirable I will only remark that his process of treatment being somewhat involved, it is not easy to examine the details, and that the use of Dr Bohm's values in my reductions would have led to the very noticeable inequality

$$\delta' - \delta = 31'5 \cos (\alpha' + 144^\circ 15')$$

indicating with certainty the necessity of large corrections of his Elements in the direction of M Laugier's and mine

Considering that fractions of minutes cannot as yet be determined, I propose for future adoption the Elements

$$I = 7^\circ 15' , \quad N = 73^\circ 40' \quad \text{for} \quad 1850\,0$$

till clearly superseded by the superior means and length of observation of some succeeding Astronomer, who can devote more than eight years of continuous research to the subject, and take advantage of finer skies, and I hope Photography I believe I shall be not far wrong in saying that a sensible improvement on the above values will not be obtainable by an expenditure of less than five thousand pounds

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SECTION V.

On the tendency of Spots to diverge

The fact will be best studied by reference to the diagrams It appears to me to be only explicable by the tendency of spots to break out two and two or to subdivide, coupled with a gyratory motion of their parts, which for every spot in the same hemisphere will take place in the direction of rotation around the pole of that hemisphere, or what is called right handed in the South and left-handed in the North Hemisphere The outer portions of two contiguous spots will therefore have opposed motions producing mutual centrifugal pressure

Compare first the following series where the tendency is exhibited in mere dots
Spots 10, 114, 165 and 228

Next, the following five instances of subdivision and divergence
Spots 182, 224, 290, 697, and 813

The following are ordinary cases, some very remarkable, as for instance 183
Groups 22, 55, 99, 124, 152, 183, 249, 250, 261, 293, 305, 487, 617, 629, 645, 687, 706, 707, 752, 811, 894, 905, 933, and 939

There are cases in which the absence of this tendency is equally to be remarked·
See 79, 139, 292, 412, 419, 664, 854, 858, 938, 941, and 951

The impression which these examples are calculated to produce would be more forcibly conveyed if the figures to which the numbers relate could again be given collectively, but the necessarily large amount of illustrations which the subject involves, forbids indulging in any repetition which can be avoided, and I must put the reader to the trouble of referring to the figures in their serial order

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SECTION VI.

On Recurrence in the same Neighbourhood

I have thought that an index to such cases of probable recurrence as I have noticed would be desirable, as the possibility of the cause of formation of a spot remaining after its disappearance, and giving rise to a second and third is a point of some consequence to the theory of their origin The variability of form renders it almost impossible to come to any decision on which argument might be based

Compare Groups 58 and 63 —58 is a single spot tending to extinction, which is succeeded next rotation by 63, a complex group in the same neighbourhood a little North

144 and 146 —Different in the same position

161 and 172 —One component of 172 occupies nearly the position of 161 when last seen

167 and 171 —The first must have disappeared

174 and 184 —Very similar and certainly different

179 —The "following" portion visibly receives a considerable re-development in the latter half of its passage over the disk

182 is followed by 192 in the same position

183, 194, 204 and 211 —194 is probably identical with part of 183, but 204 is a renewal after entire obliteration, and 211 is a second renewal in the same part

193 and 203 —Very similar outbreaks 193 must have disappeared several days before the first appearance of 203

220 and 229 —Examine the accession to 229 and compare with 220 B

667, 690 and 711 —Seem to be three successive outbreaks in nearly the same part

703 and 723 —Dots in nearly the same place

704, 724 and 746 —Three successive outbreaks

817 and 842 —Distinct outbreaks

854 and 940 each receive considerable accessions in their passage over the disk

CONCLUDING SECTION.

FROM a desire to dismiss this self-imposed task for the present, which of late has been continued with much personal inconvenience, I forbear here to enter on the evidence which the motions of normal spots afford of the existence and extent of a refracting atmosphere round the Sun The method has been sketched out elsewhere and an example of its application given Much additional matter is contained in this memoir for following on the inquiry at a future time

I equally forbear from theoretical speculation on the origin of the term in the Rotation of the Photosphere depending on the latitude The general fact which it more accurately expresses of Rotation at the Equator faster than the mean angular motion, however, appears to me strongly to support the views expressed by Professor W Thomson in his memoir on the "Mechanical Energies of the Solar System," (Trans Roy Soc Edin Vol. xxi) in which a continued acceleration of the Sun's rotatory motion is shown to be one probable consequence of the vortical motion of the meteoric matter which is there shown to be the most probable source of the Solar heat and light In the absence of an impressed motion from some such external source it would be expected that the currents of the surface of the Sun would resemble those of the Earth's ocean and atmosphere, and be Westerly and towards the Poles in the tropical latitudes, and Easterly in the higher latitudes, the direction of Rotation in each case being the same, and the Equatorial region in each the hottest

At the end of the series of illustrations I give a Plate on which are laid down to scale, 1stly, the variations of Spot-frequency, 2ndly, the variations of the distance from the Sun of the Planet Jupiter, and 3rdly, the variations in the Imperial average price of wheat as published by Mr Stanton of the Estates Gazette Office in Fleet Street The first of these curves is deduced by interpolation from the annual mean numbers deduced by Prof Wolf of Zurich, from various ancient series of observations which he has sought out and collected, and which are given in No 12 of his "Mittheilungen uber die Sonnenflecken," p 72 The extension backwards which Prof Wolf has thus given to what was previously known on this periodic variation is extremely valuable, and presents a problem for solution of very high importance, and which has been for some years before me as a subject of thought I purposely contrast with it the variations of Jupiter's Radius Vector, as offering the only approximate agreement which I have been able to perceive It will be seen that from the year 1770 there is a very fair general agreement between maxima of frequency and maxima of Jupiter's Radius Vector, and

between minima and minima, with such an amount of loose discrepancy as to throw grave doubt on any hasty conclusion of physical connexion In the two periods which precede that date there appears to be a total disagreement, and although the data for frequency are less certain for those years, yet the general form of the curve of Prof Wolf is probably too well established to admit of anything like reversion by the addition of other observations which have not yet come to hand In this case, though unfavourable to our purpose, it is important to see before us an instance in which eight consecutive cases of general but imperfect agreement between the variations of two physical phenomena are shown to be insufficient to base any conclusion upon, at the same time that they powerfully stimulate further inquiry with the view of ascertaining whether the discrepancy may admit of future explanation I attach no importance to the wheat diagram, but data of this kind were employed in an interesting and original investigation of the elder Herschel which has been frequently referred to in subsequent years The present diagram appears to me rather to indicate that, concurrently with abundant and deficient crops, social and political causes affect prices to an extent sufficient to destroy their value for the purpose for which he selected them * Returning to the Jupiter curve and bearing in mind the part which the material of the Zodiacal light plays in the opinion of Prof Thomson, I suggest that it deserves consideration whether the mass of Jupiter may not affect the variations of Solar Spot-frequency indirectly through his possible intermediate action on the ring of matter constituting the appearance termed the Zodiacal light If this view should be thought of any weight it will be seen to be desirable that in establishing a special station for the further observation of Solar phenomena, a situation should be selected, where at the same time observations may be made under the most advantageous circumstances on this ring of matter, of which so little that is exact is yet known, and this leads at once to the conclusion that such a tropical station as Captain Jacob had intended to occupy in India is the most suitable for the purpose. There at an elevation of 5000 feet above sea, almost continuous observations might be made on both phenomena simultaneously, and in no other than a similar position.

It hardly needs the addition of my opinion that in future observations of the Sun and his Spots, the methods of photographic registration and of Nature printing of the results, brought to a high state of completeness and efficiency by Mr De la Rue are obviously those to be followed, rather than the method of sketching and time observations which I have employed, while those improved processes were not yet worked out I refer particularly to an admirable specimen recently published by Mr De la Rue in the Monthly Notices of the Royal Astronomical Society

* It will probably be noticed, that no previously uninformed person could from the curve infer the year of the abolition of the Corn Laws

PLATES.

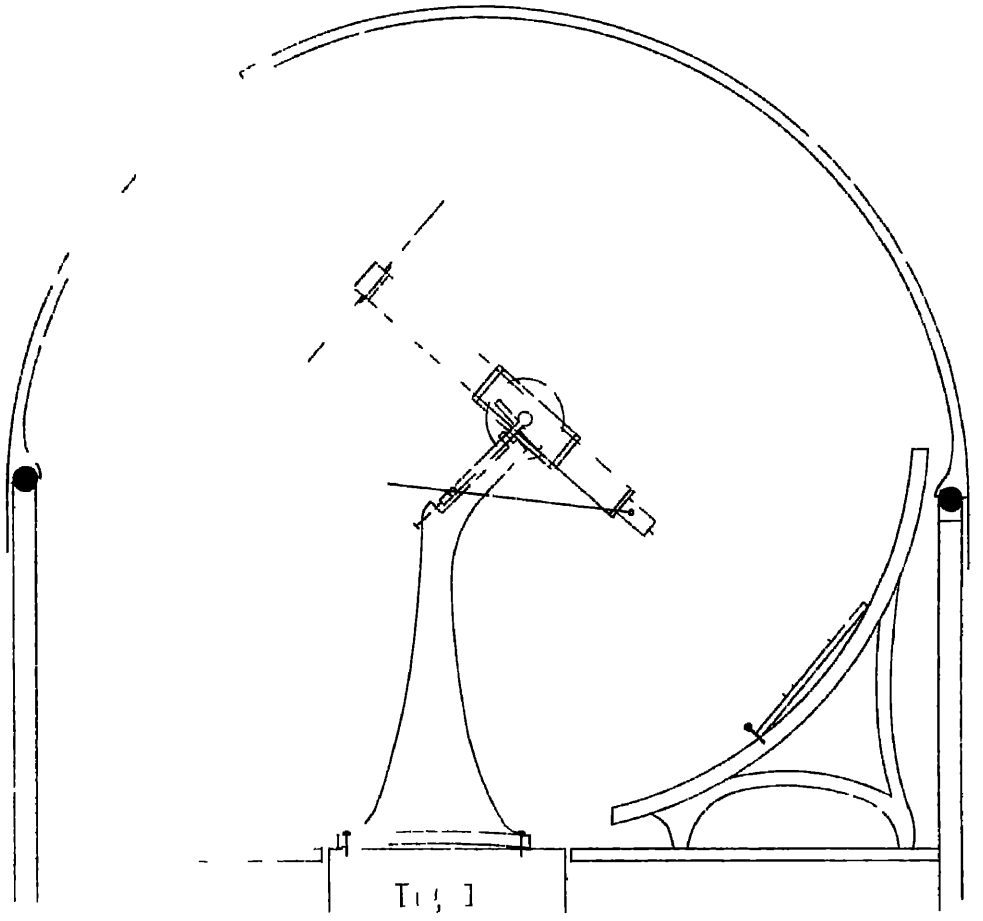
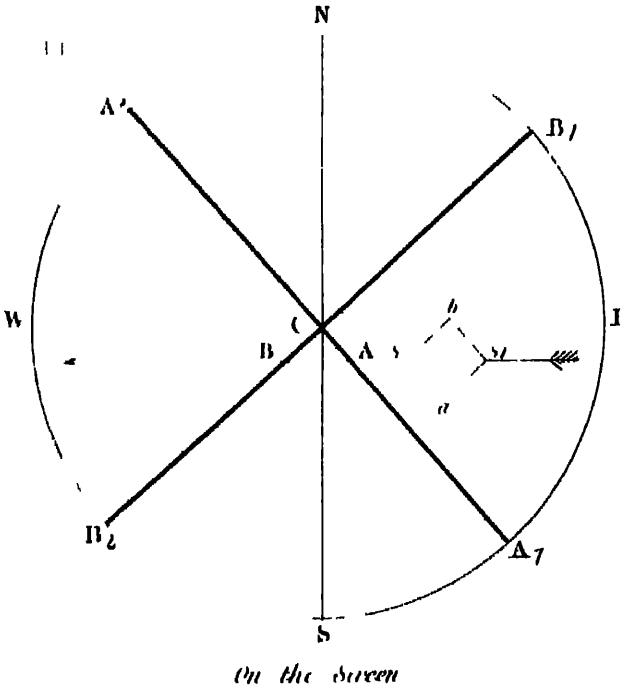
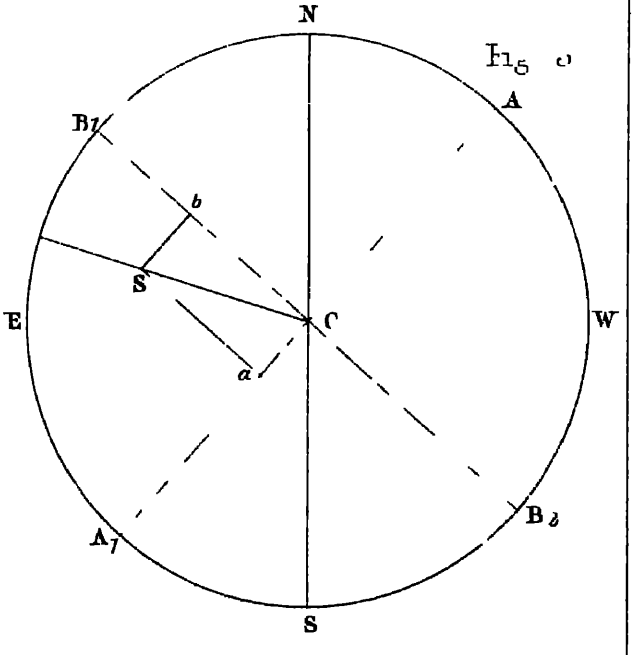


Fig 1



On the Screen



On the Sun

Fig 2

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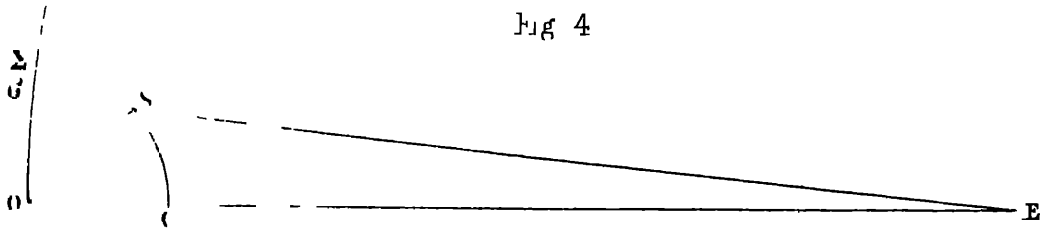
Fig 4



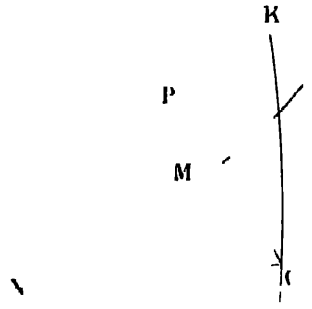


Fig 6

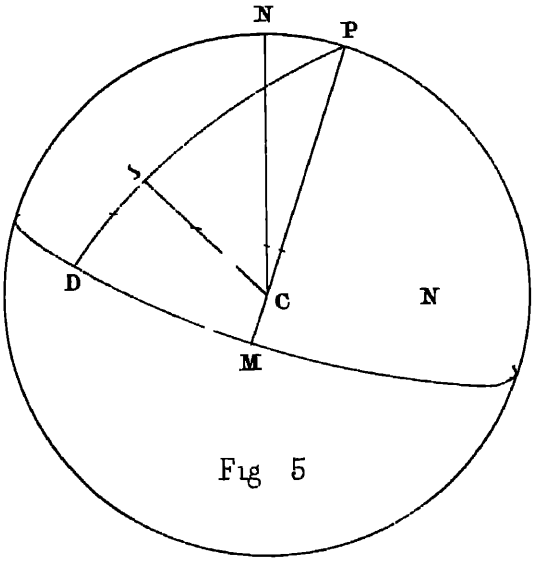


Fig 5

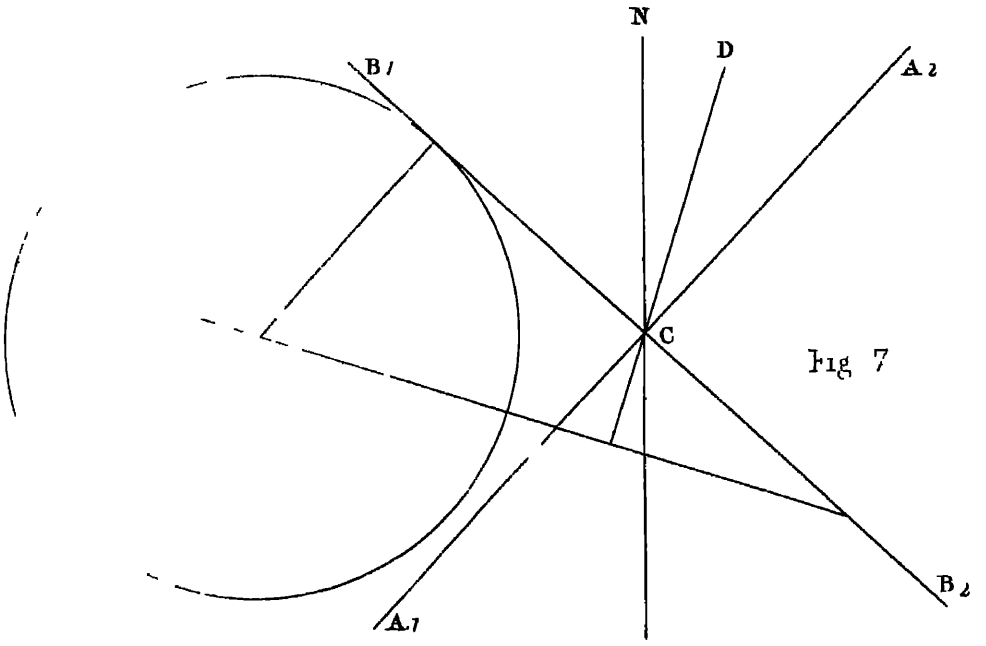


Fig 7

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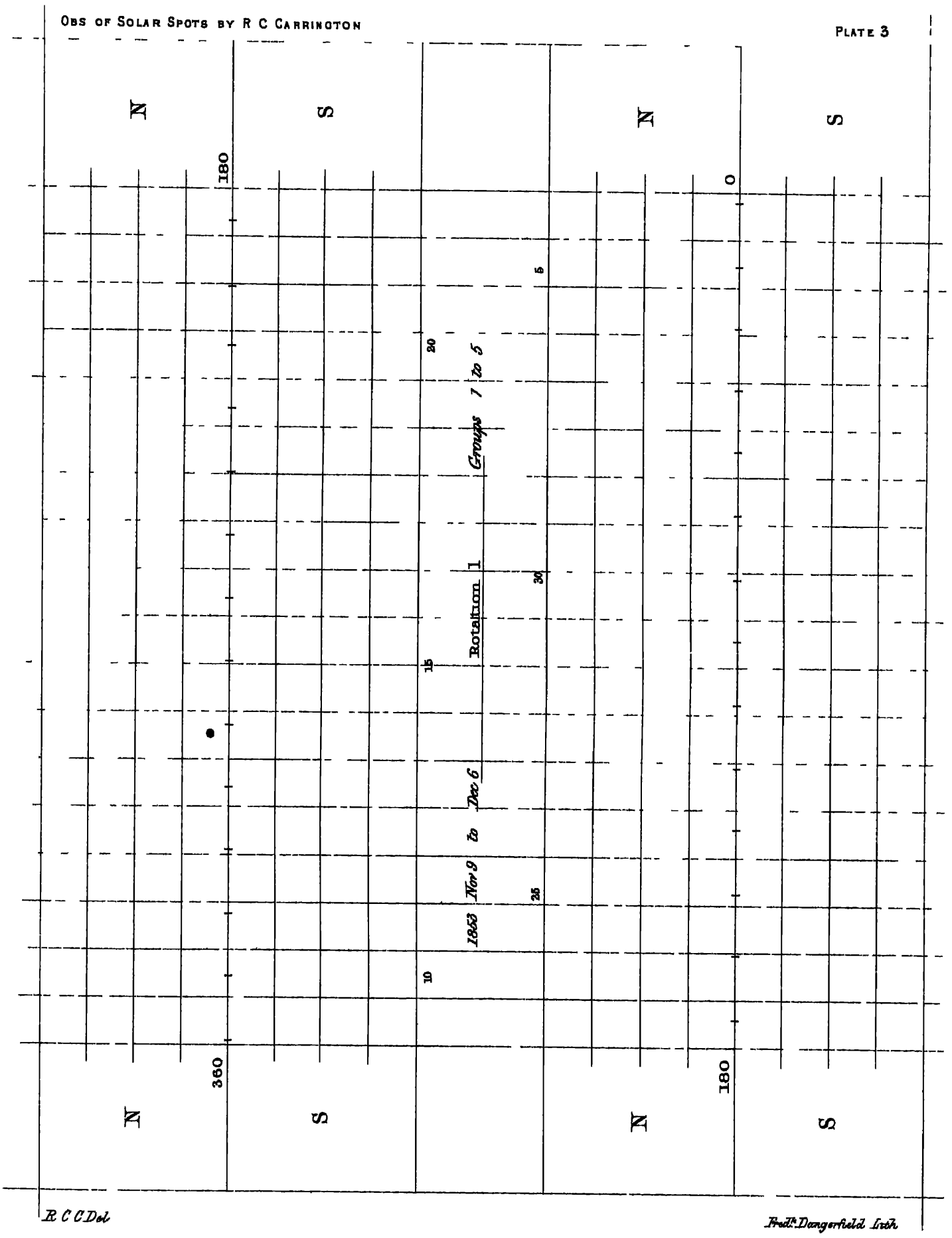

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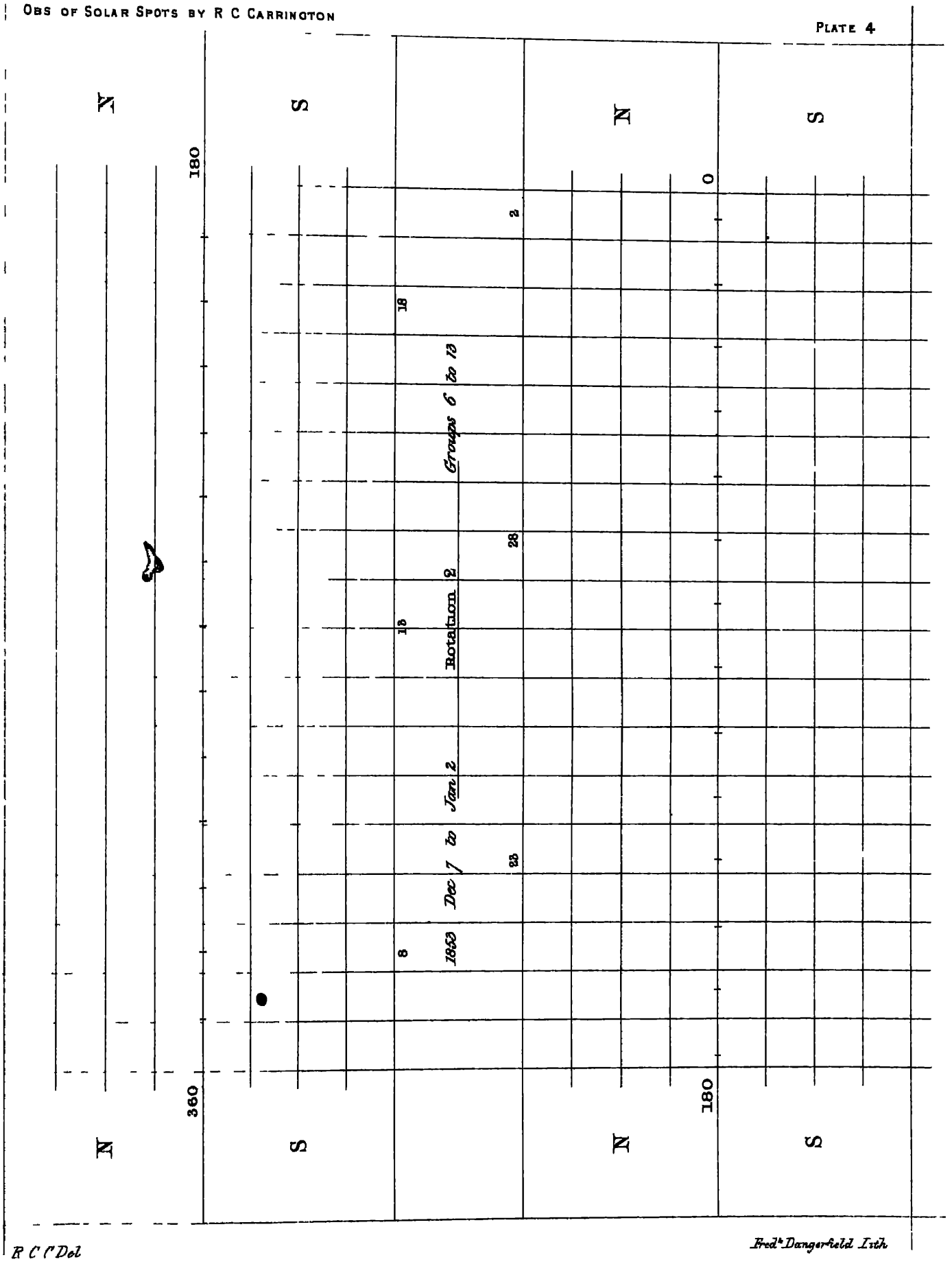
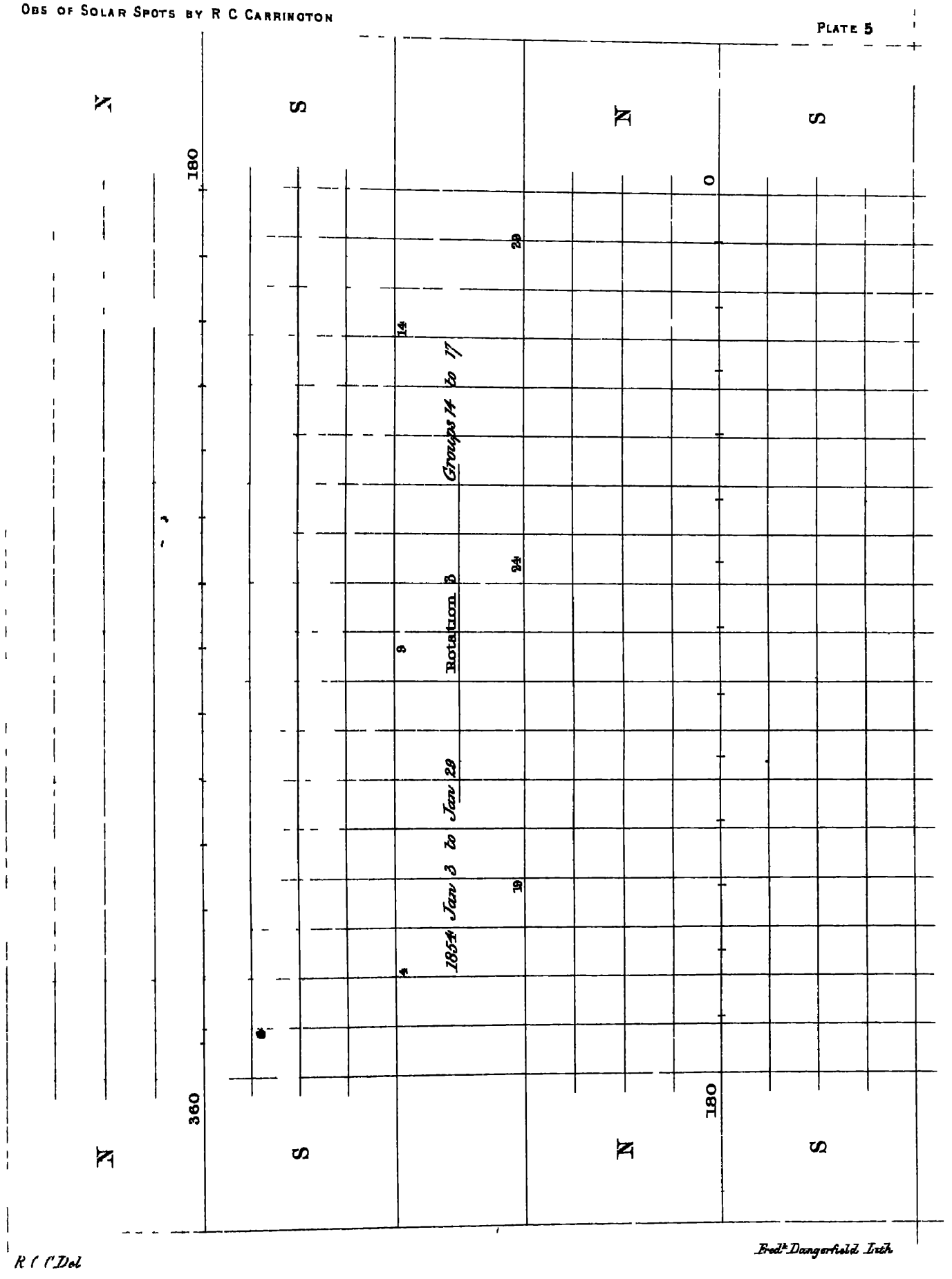
OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 4





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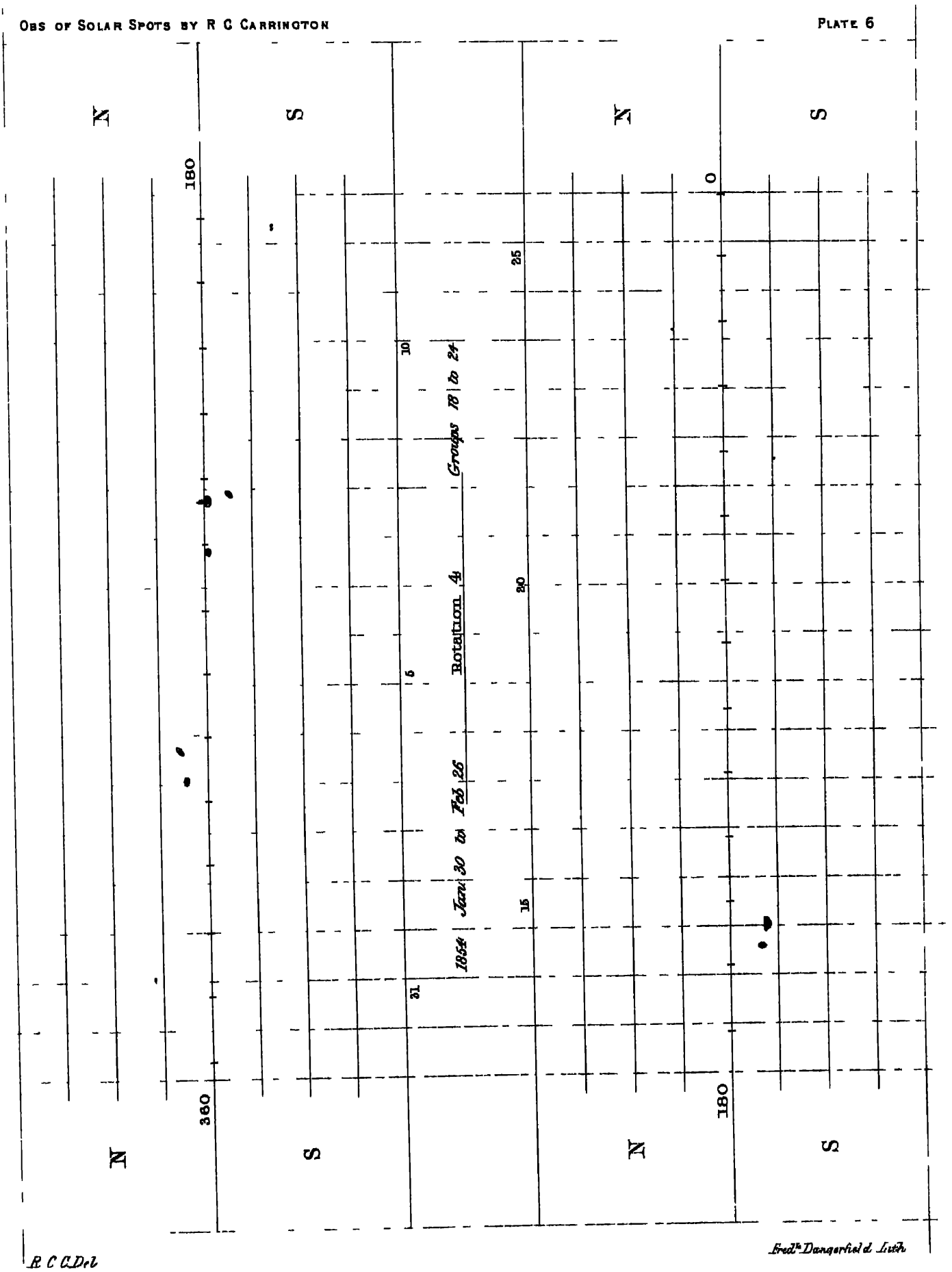

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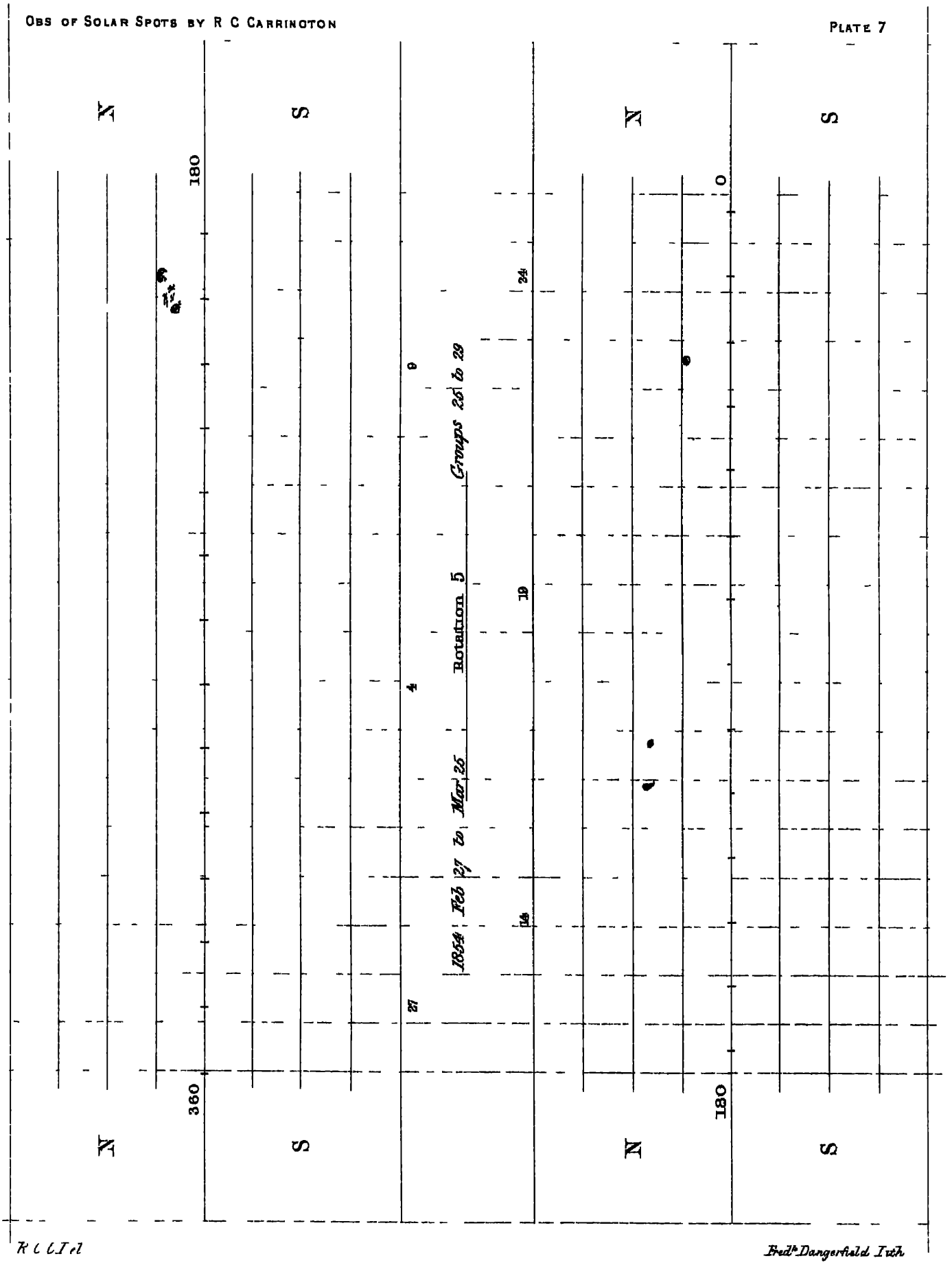
Obs of Solar Spots by R C Carrington

Plate 7



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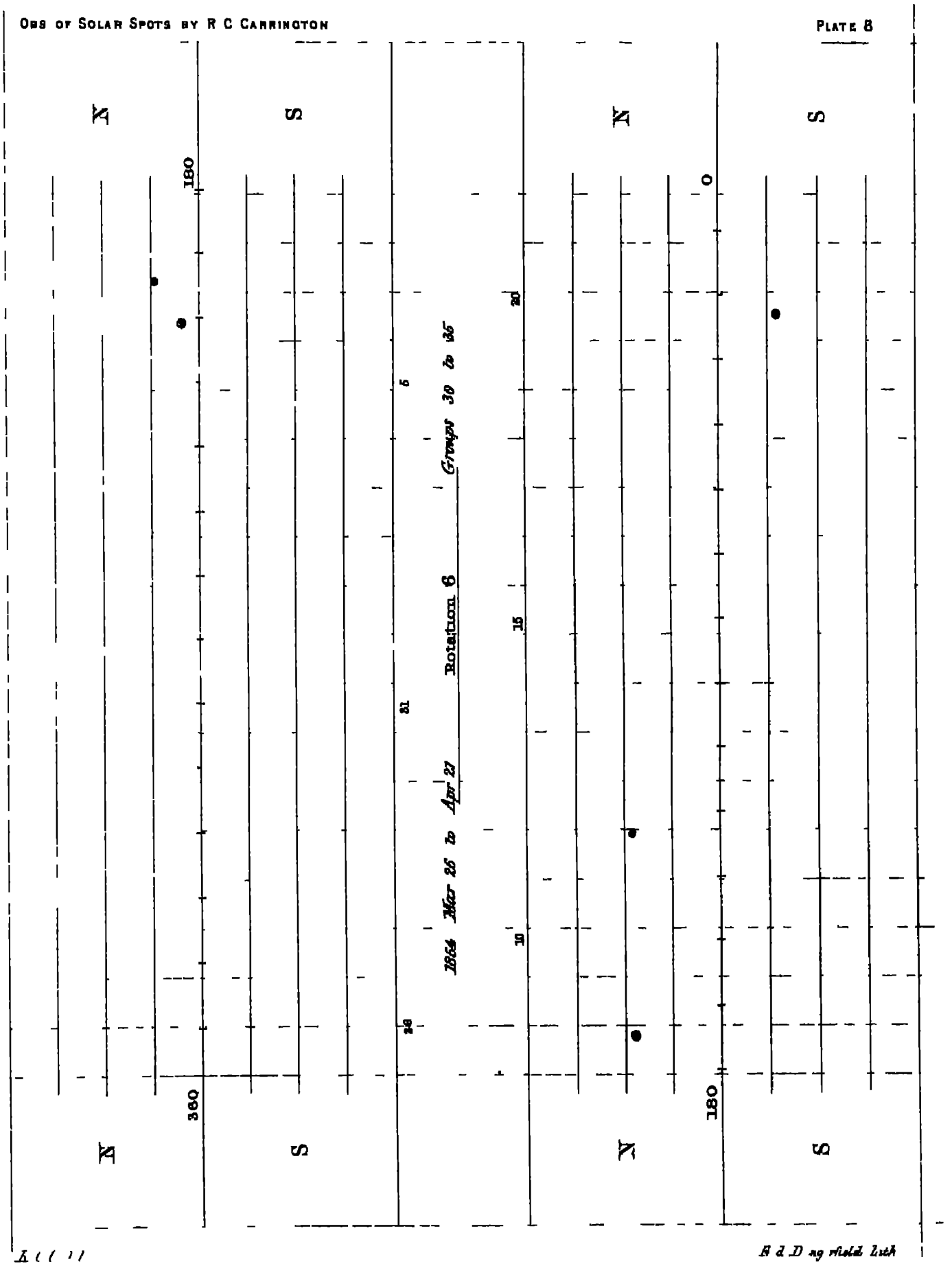
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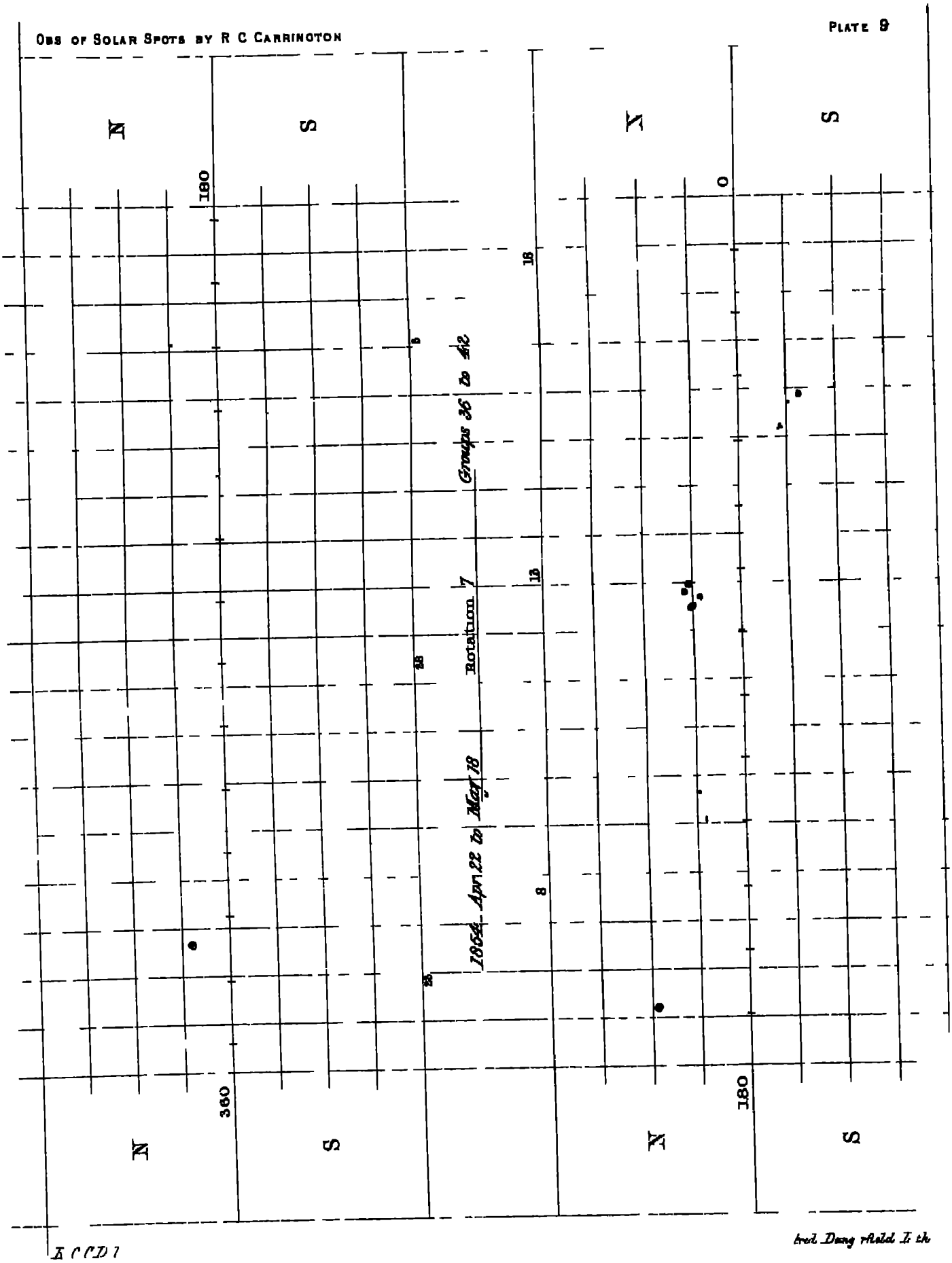

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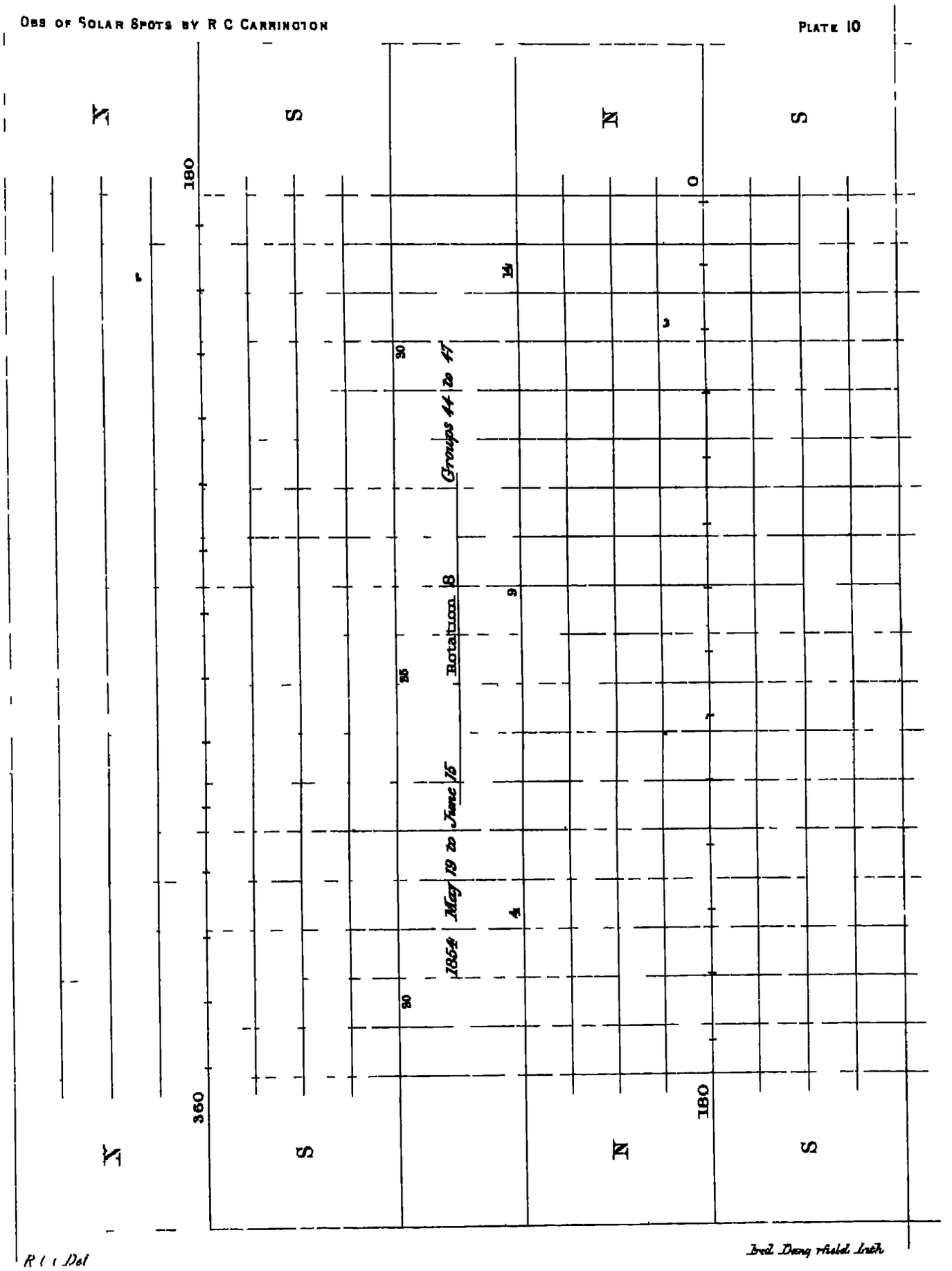

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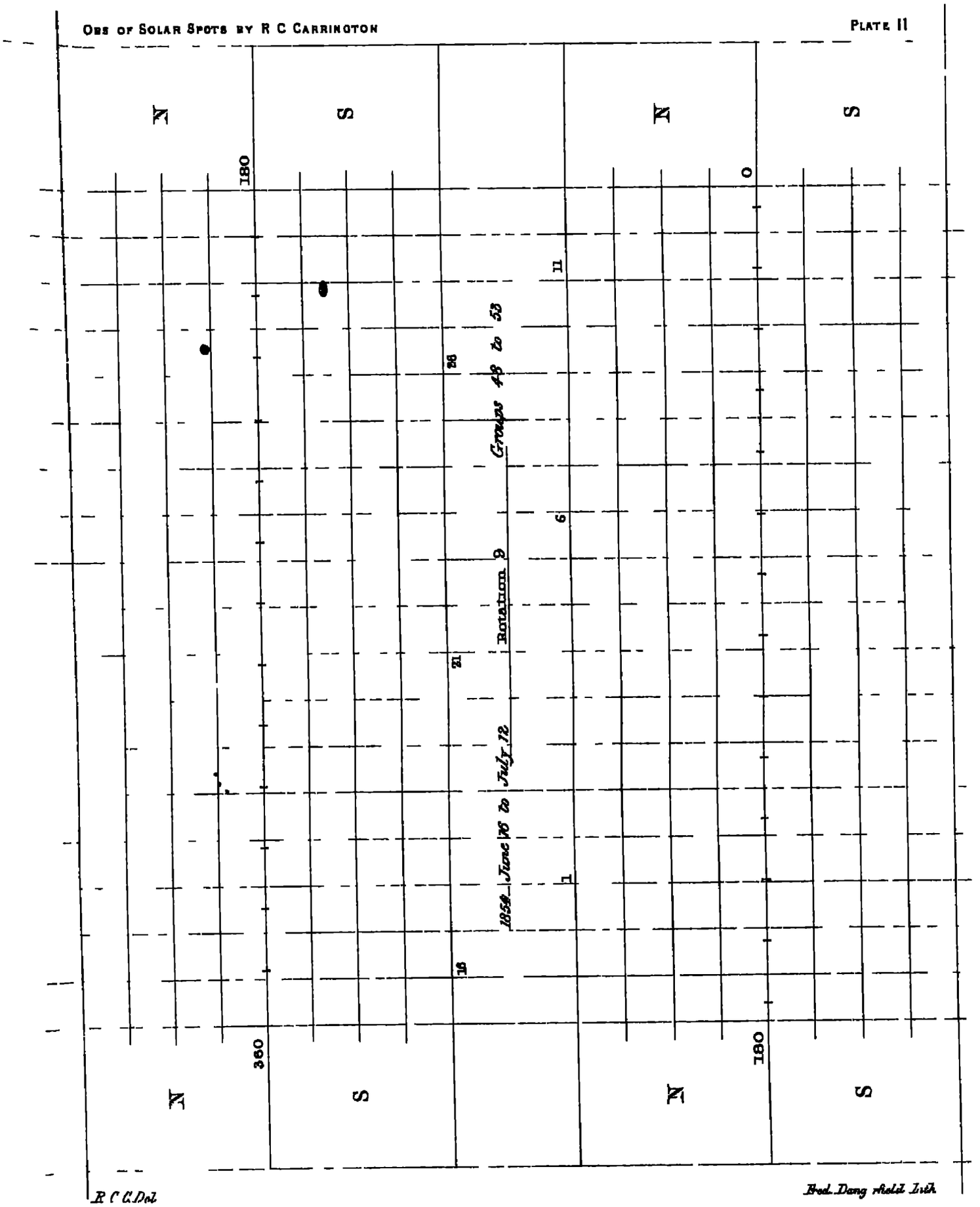

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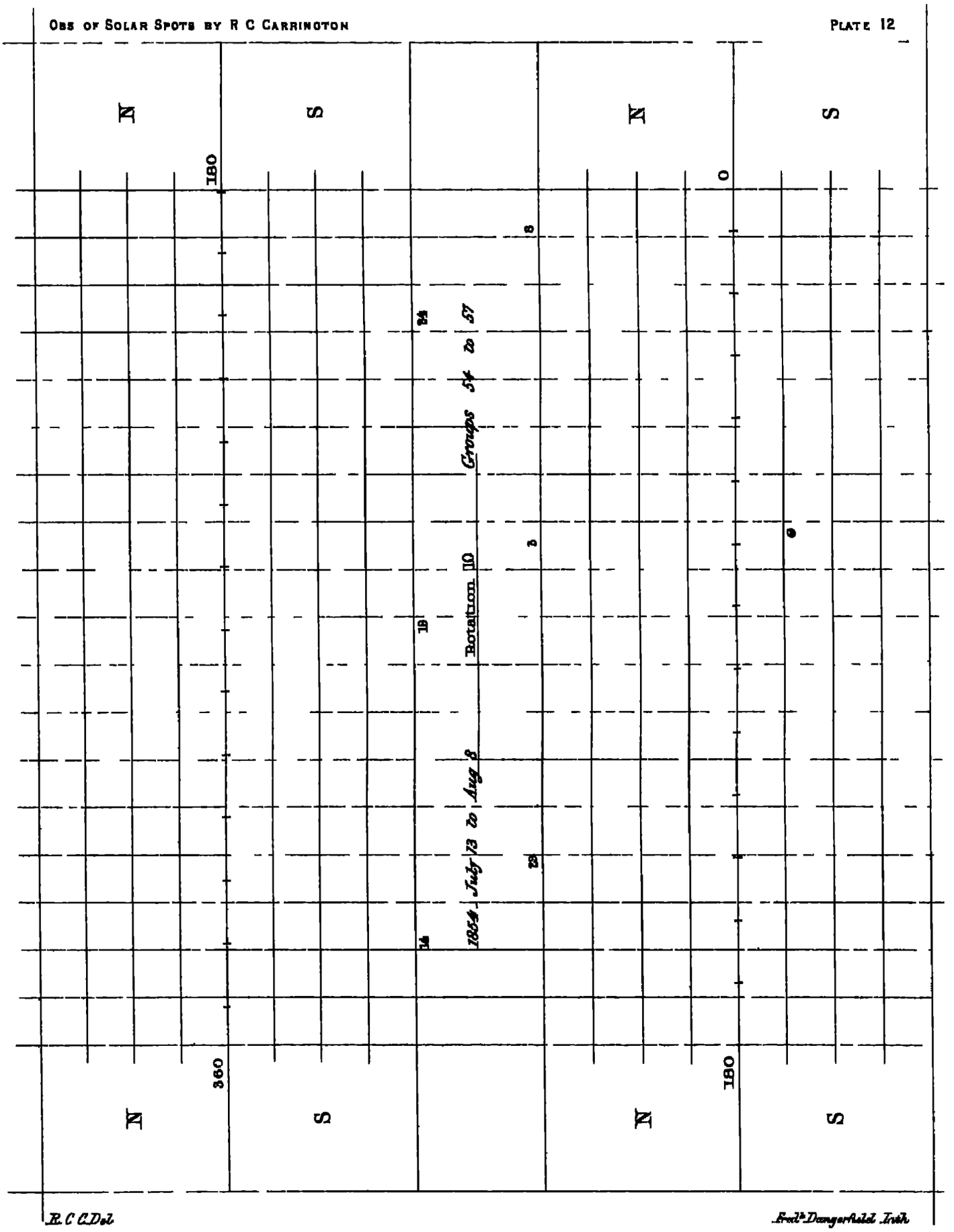

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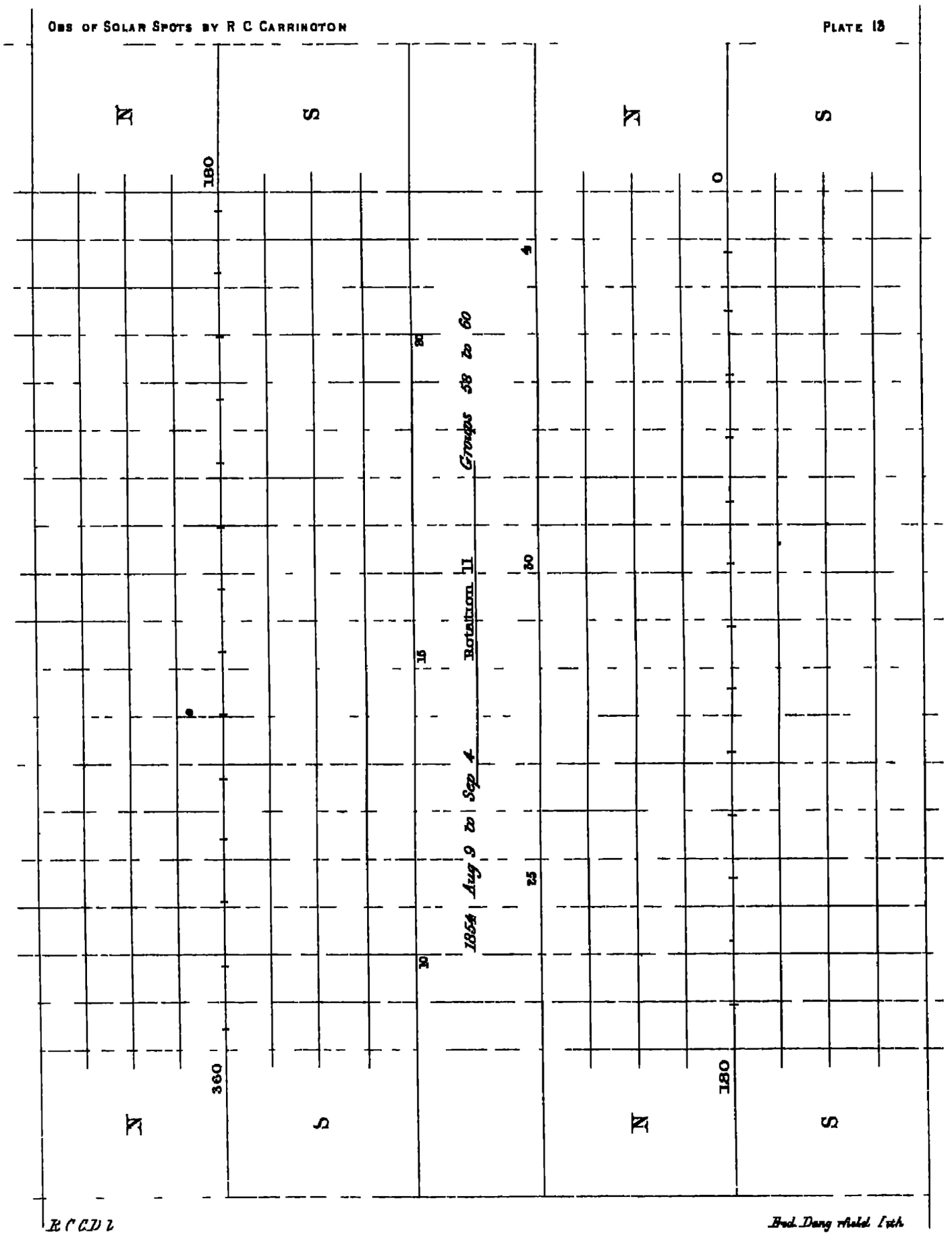

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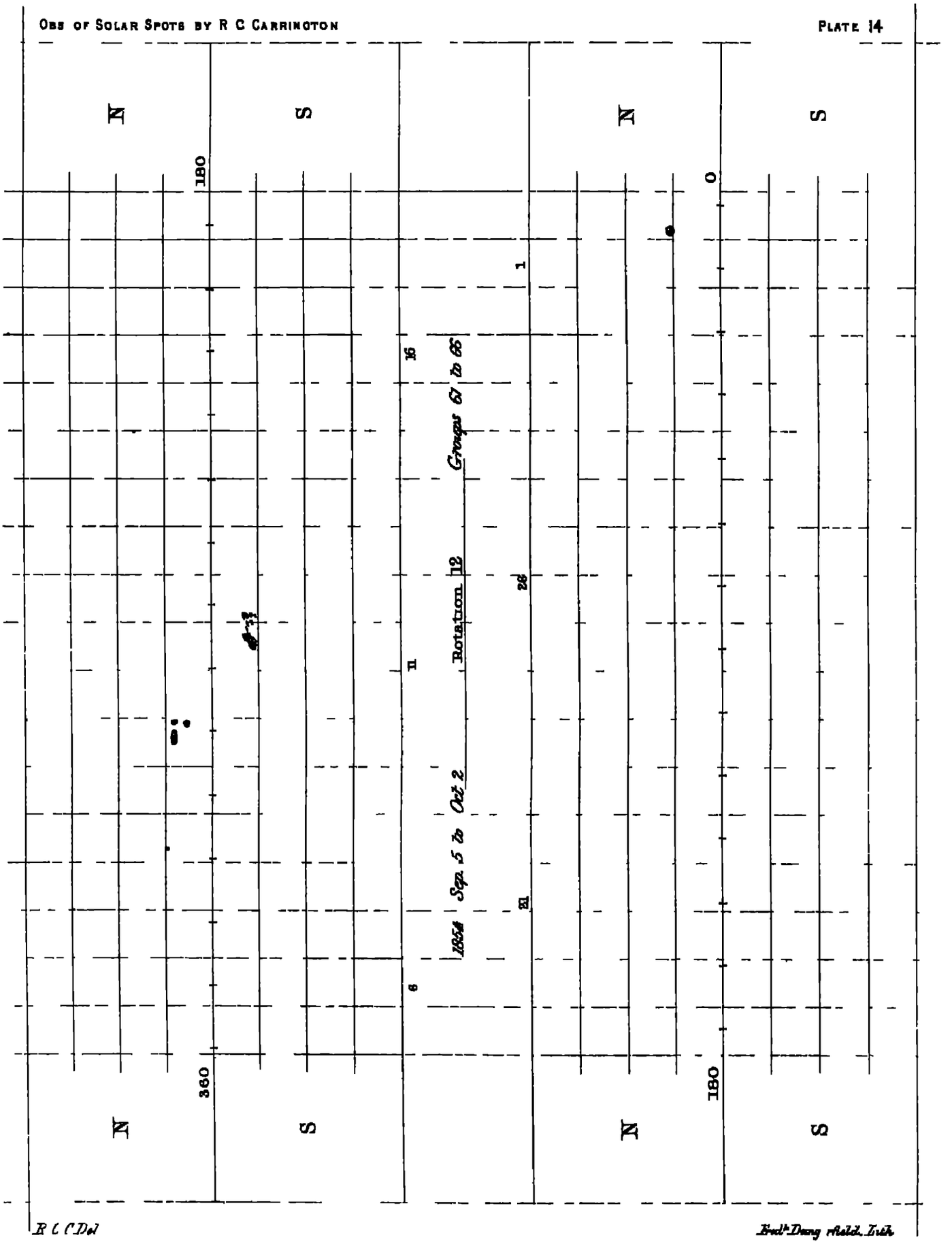

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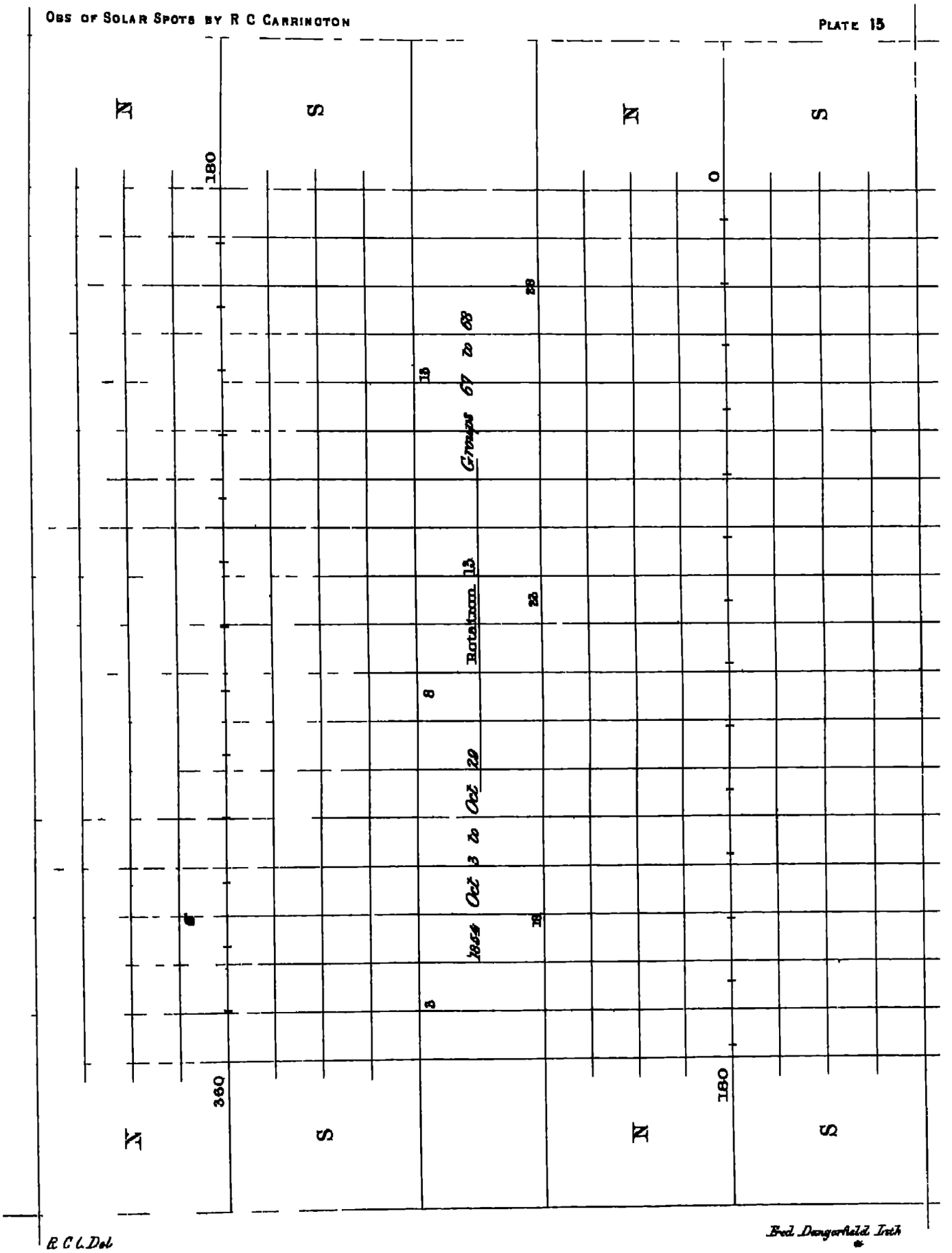

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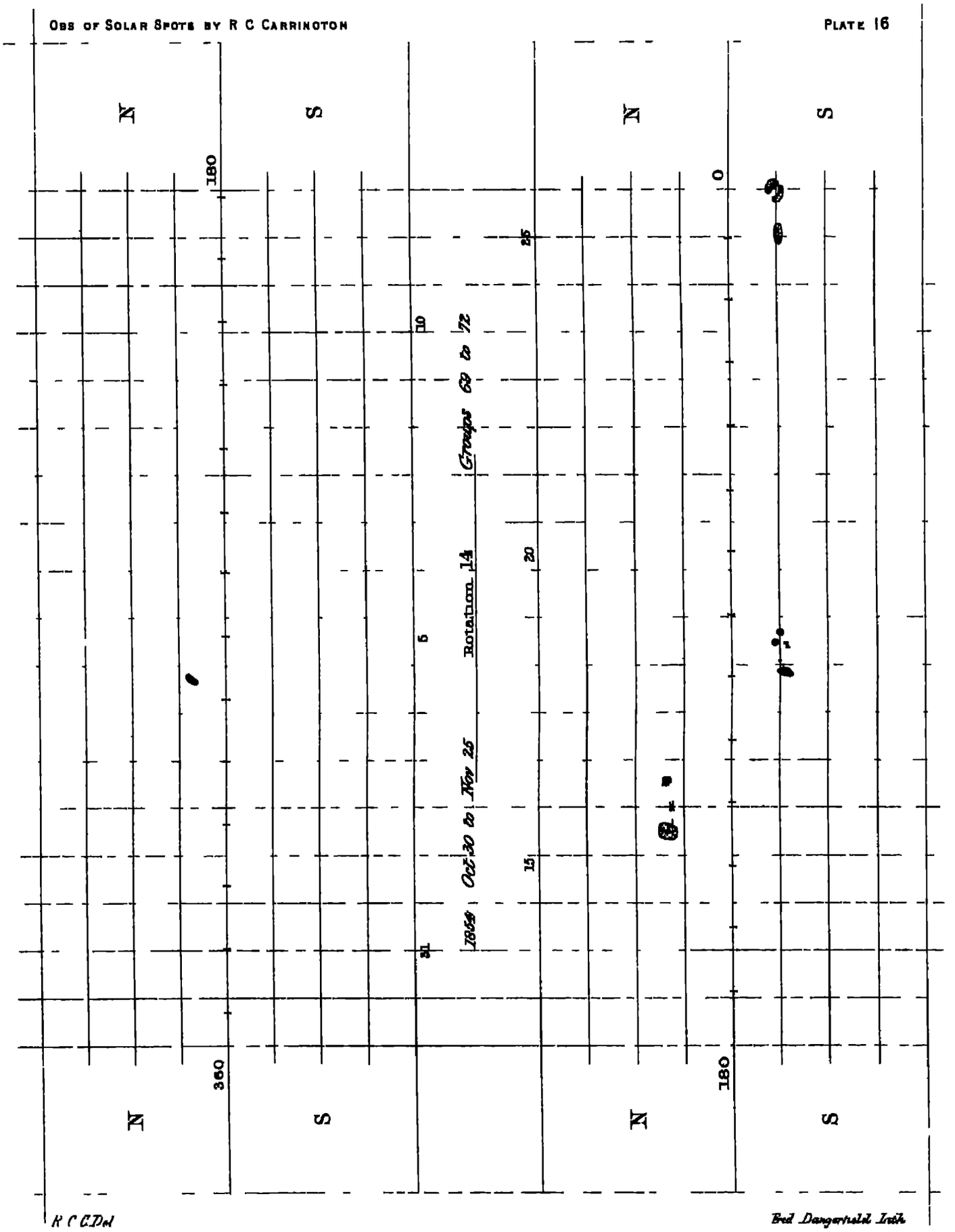
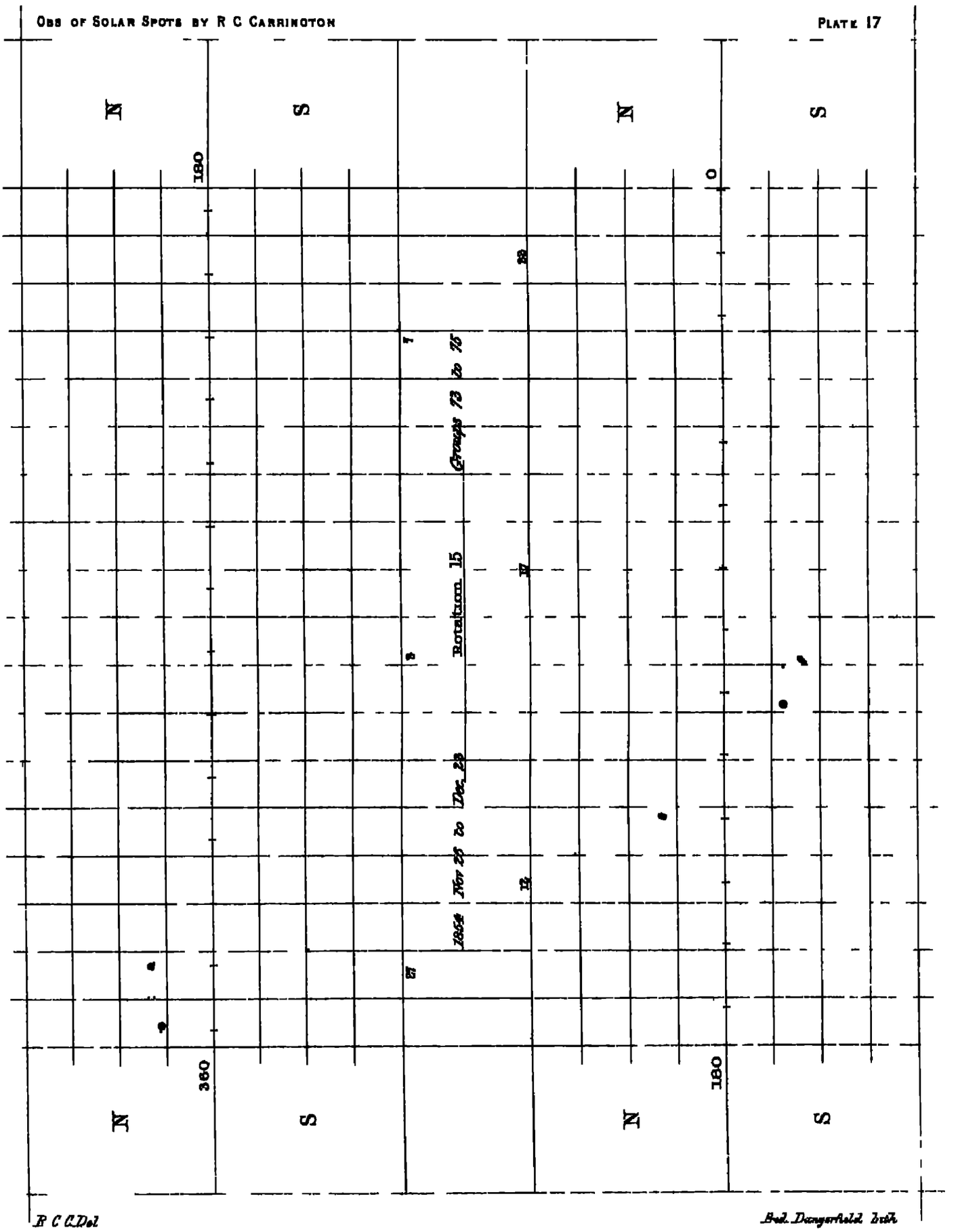


R C C Del

Fred Dangerfield Lith

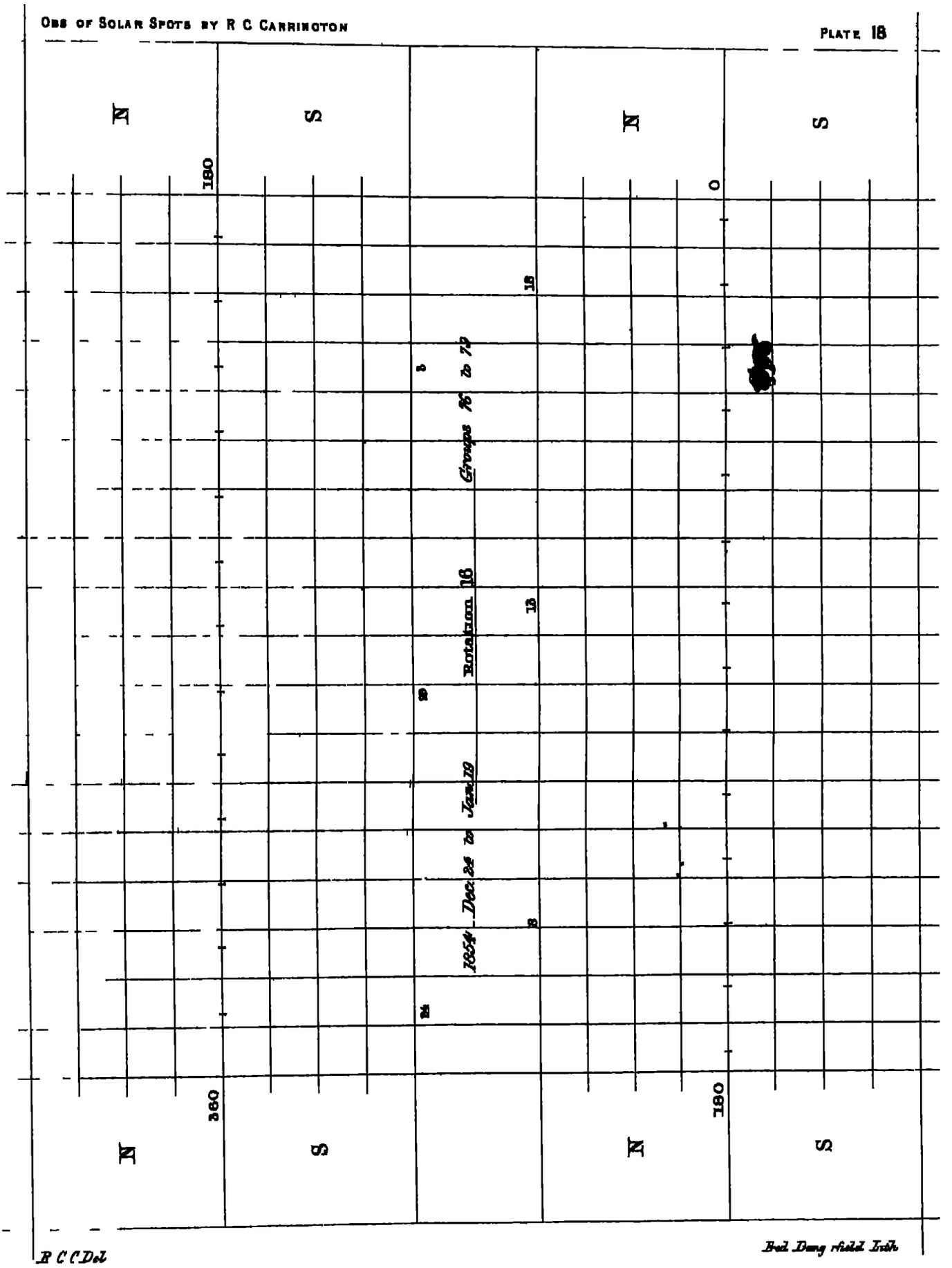


R C C Del

Fred. Dangerfield Lith

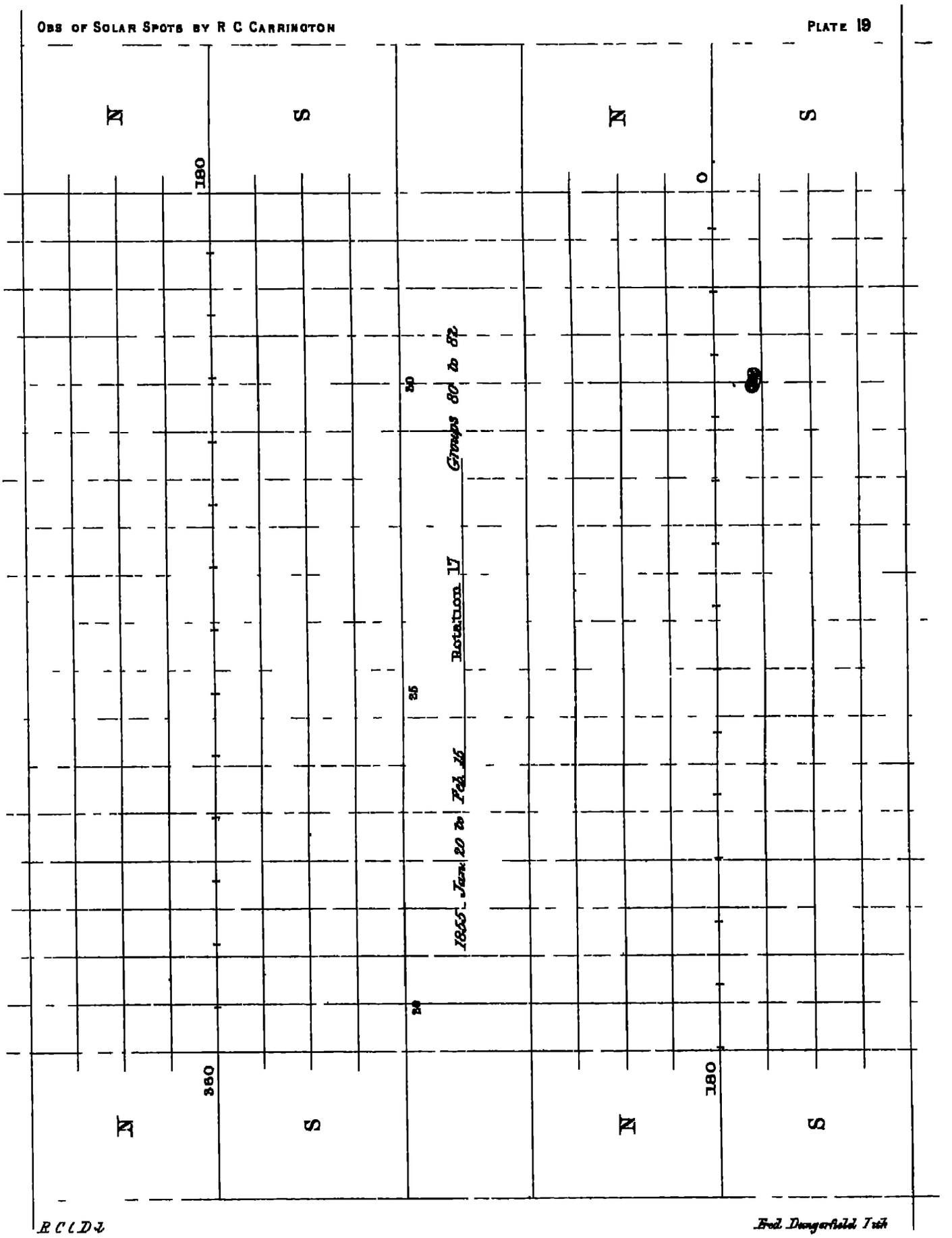
Obs of Solar Spots by R C Carrington

Plate 18



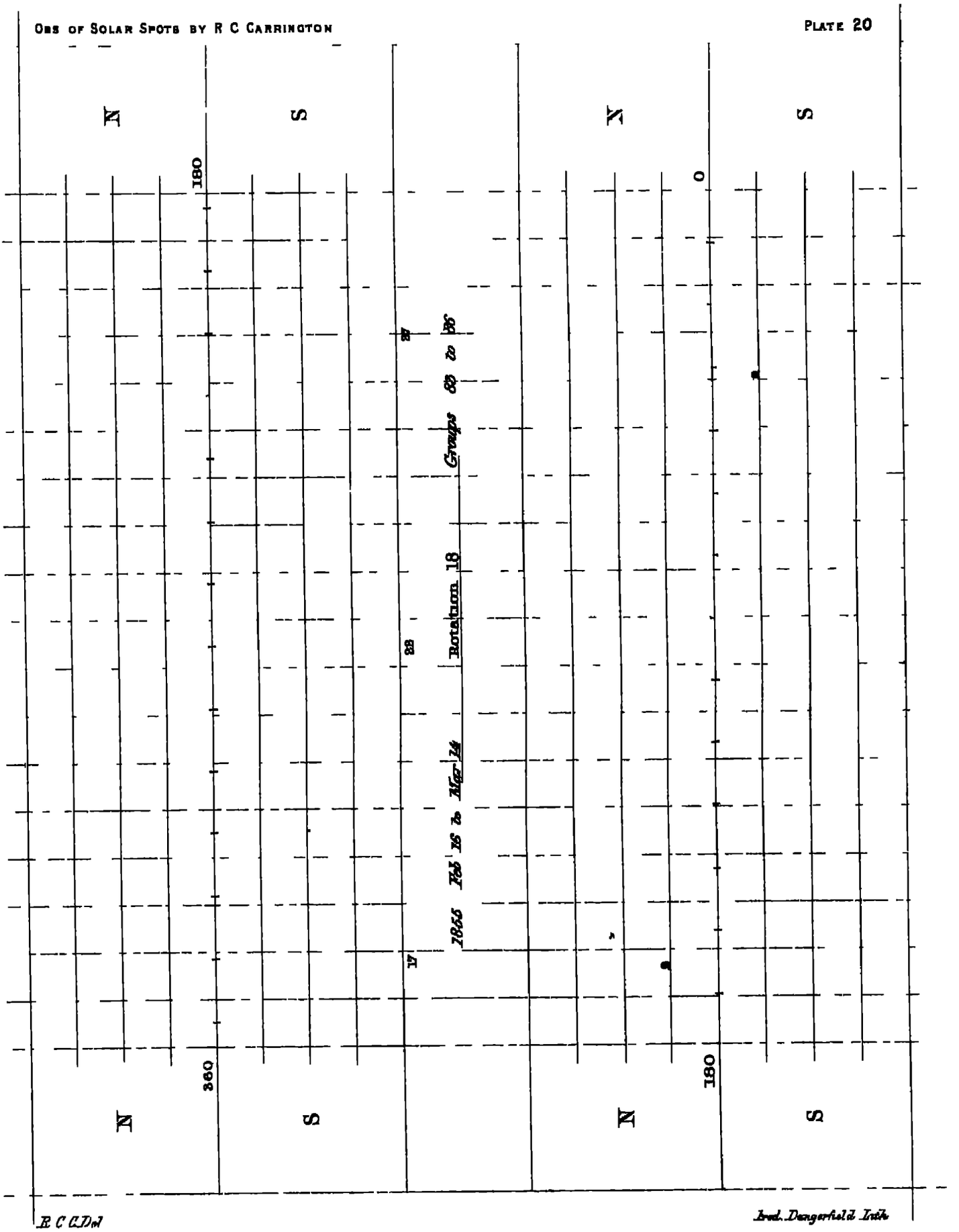
R C C Del

Fred Dangerfield Lith



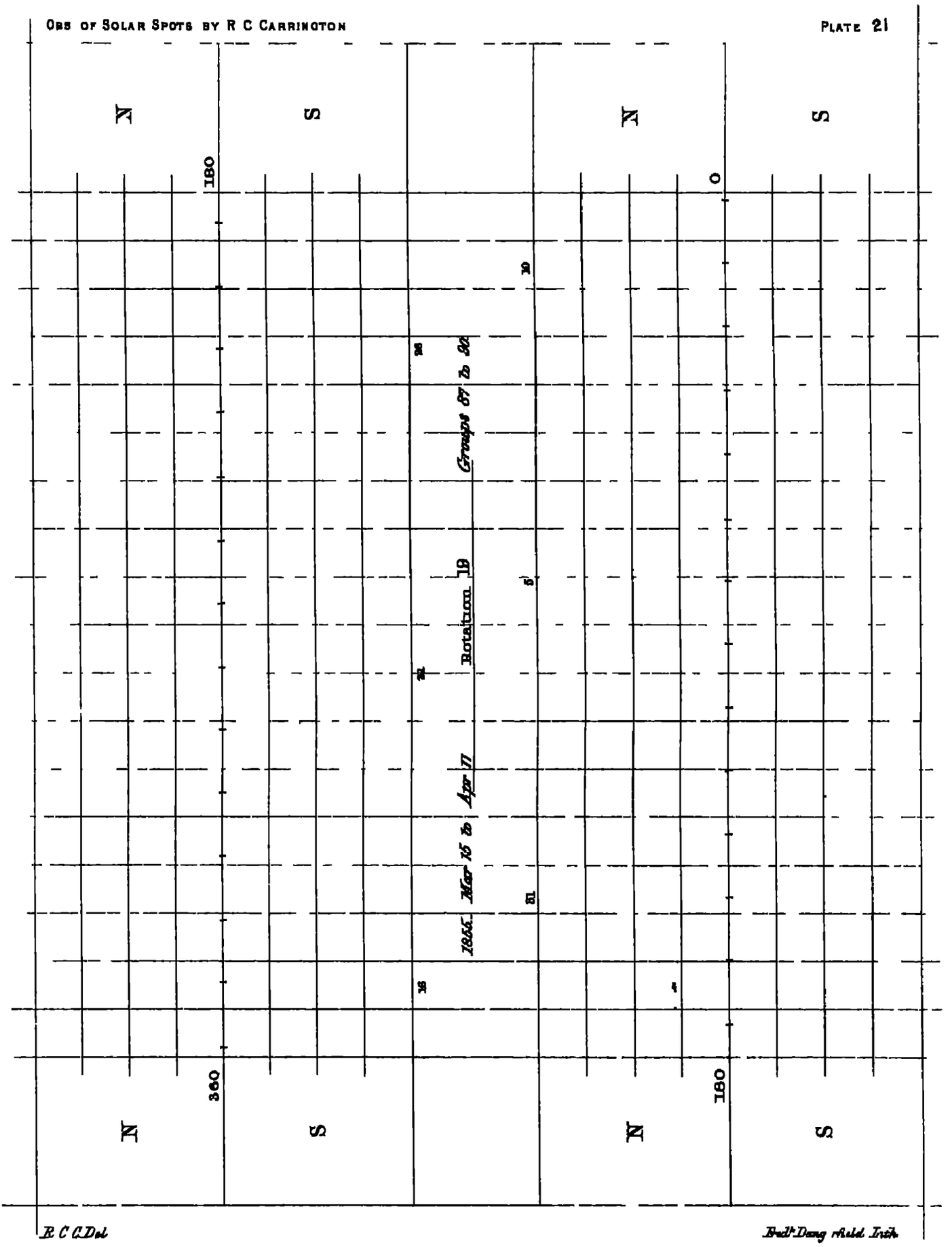
R C C D 2

Fred Dangerfield Lith



R C C Del

Fred. Dangerfield Lith



R C C Del

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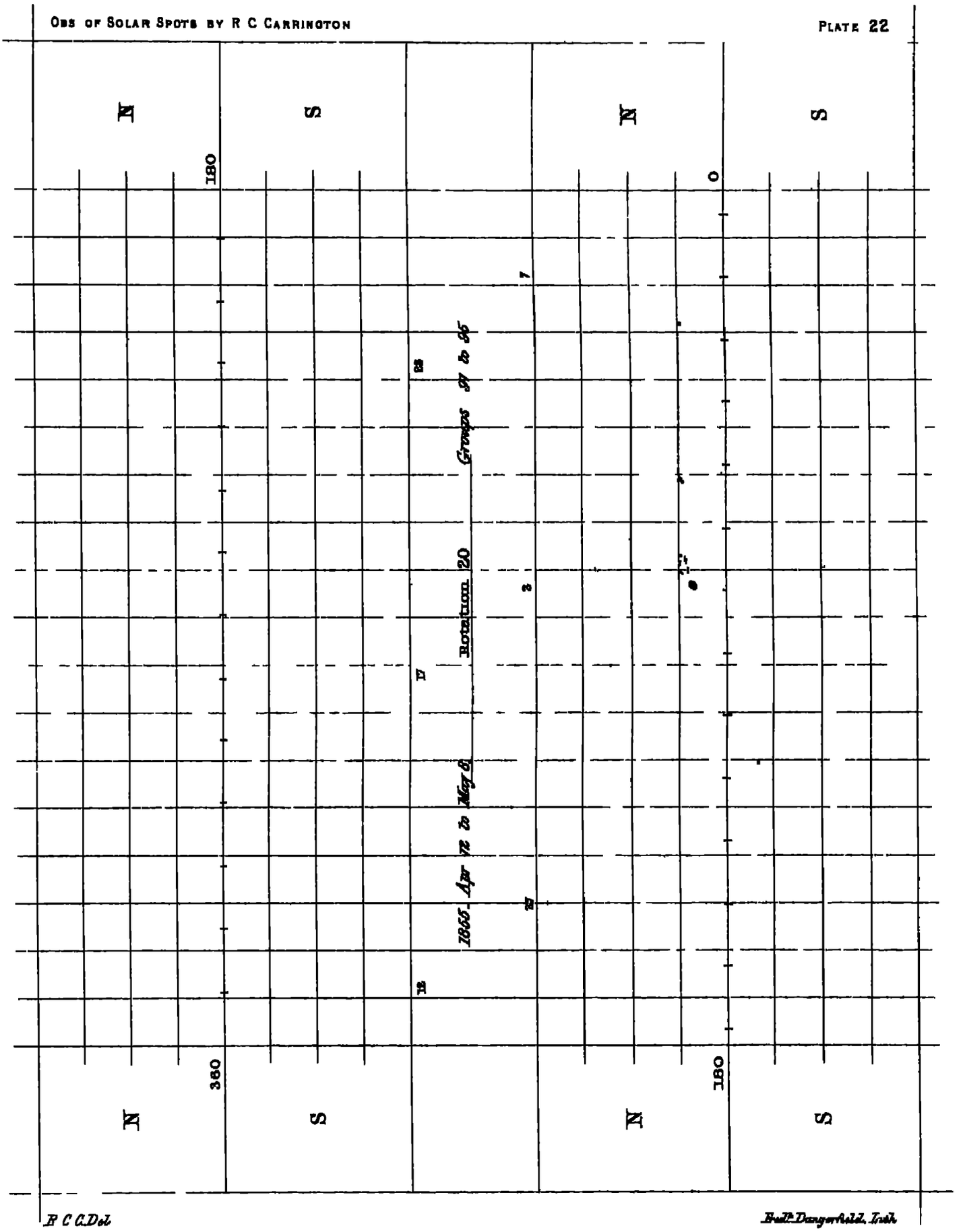
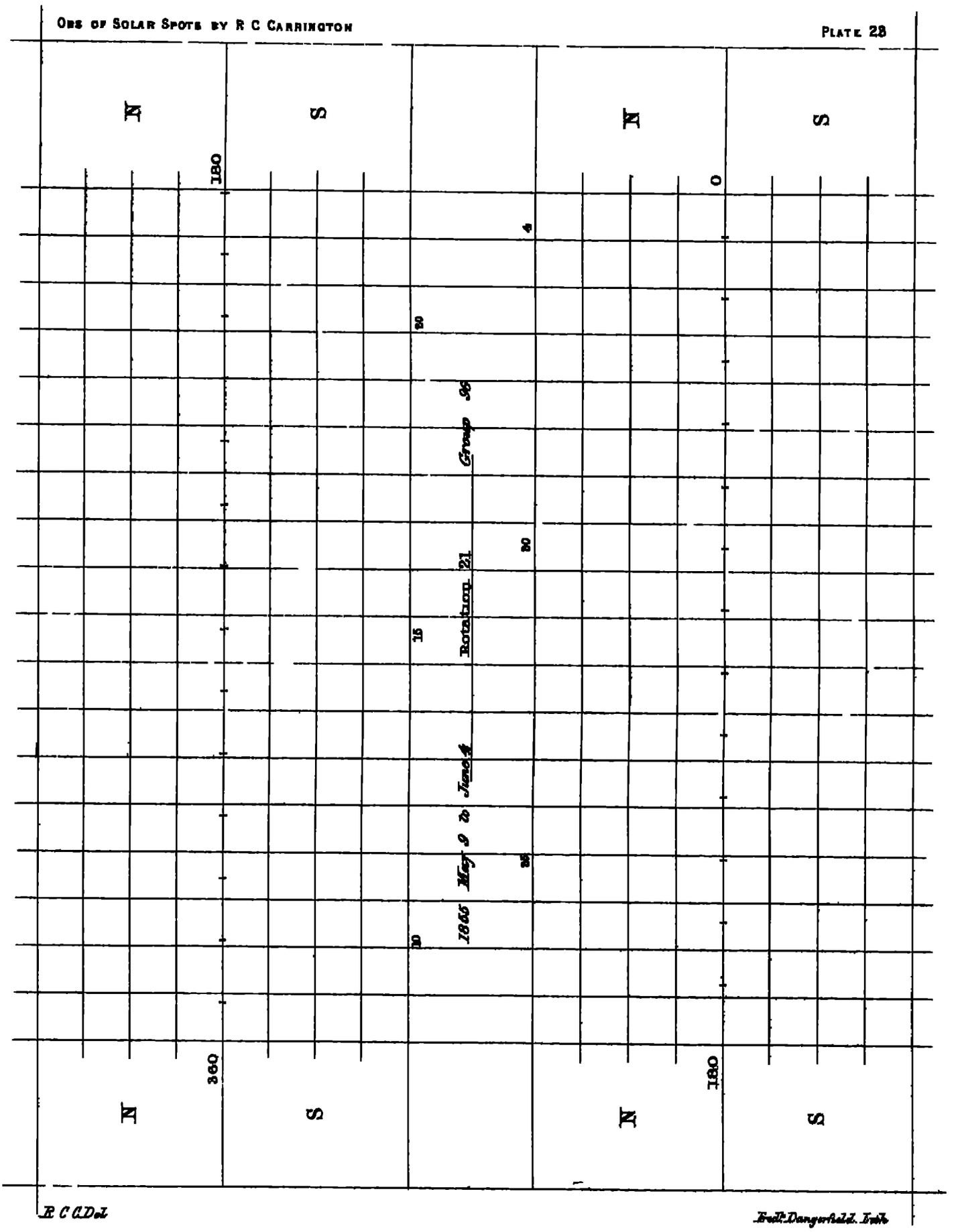


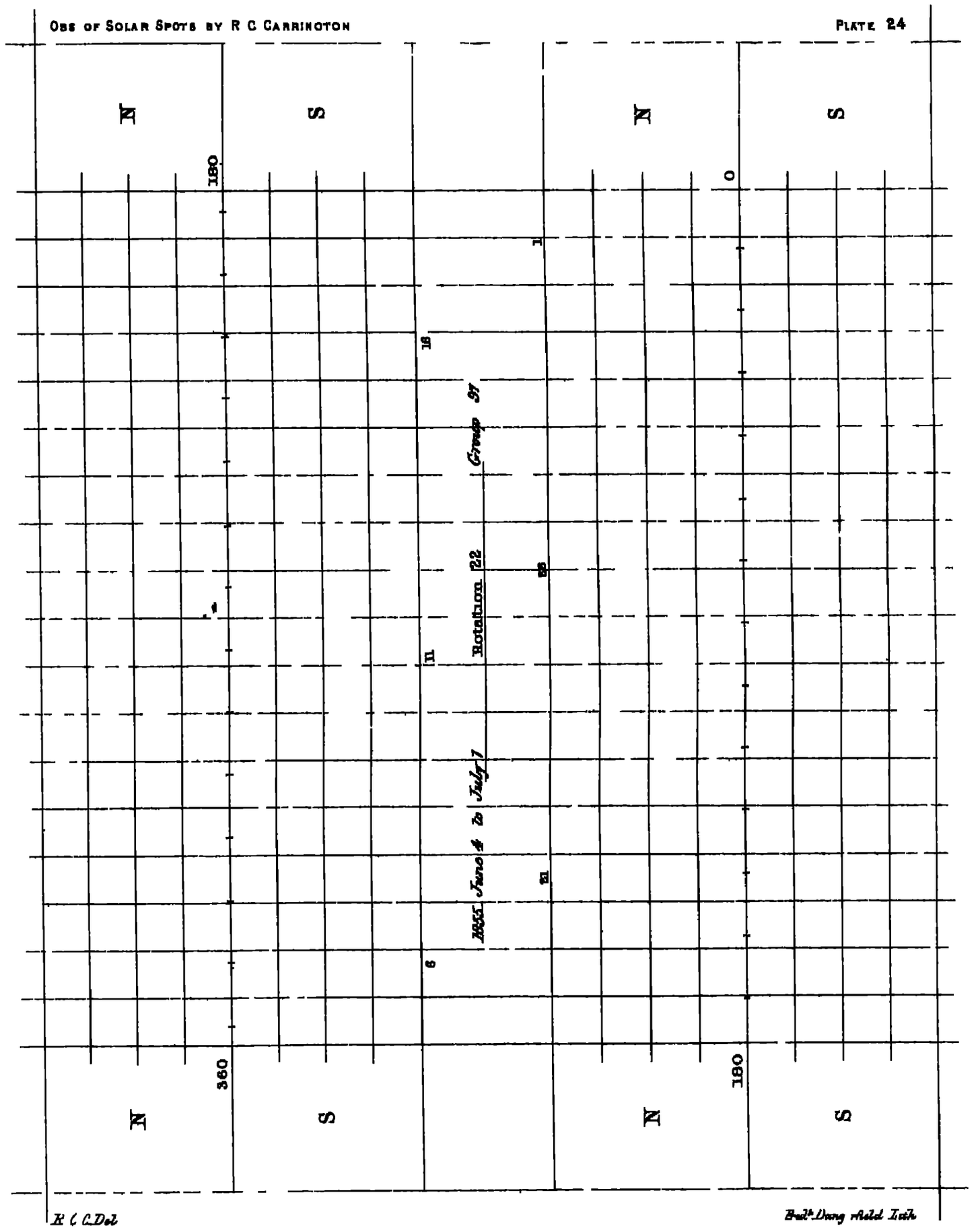
R C C Del

Eudh Dangerfield, Lith



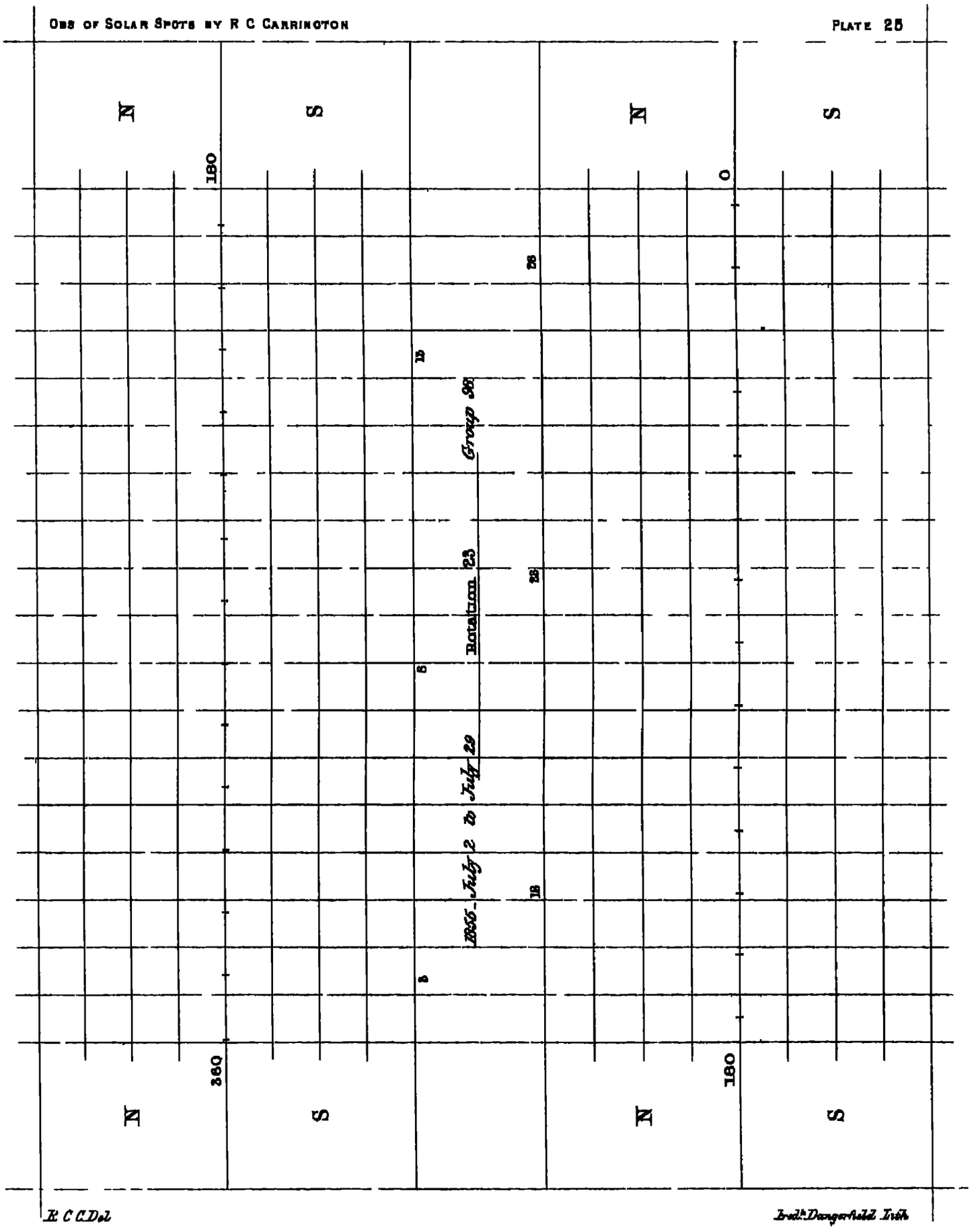
R C C Del

Fredk Dangerfield. Lith



R C C Del

Edwd Dangerfield Lith



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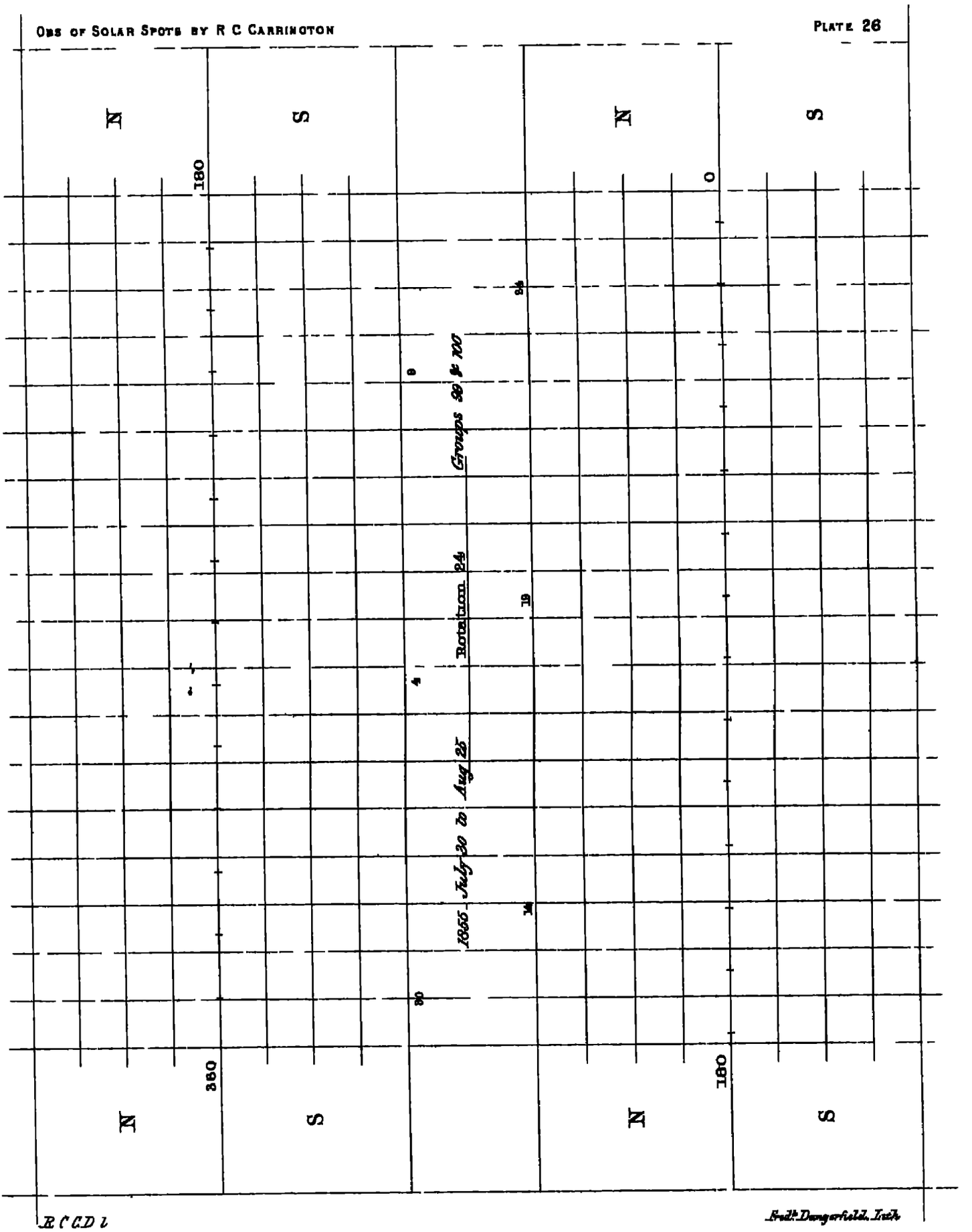
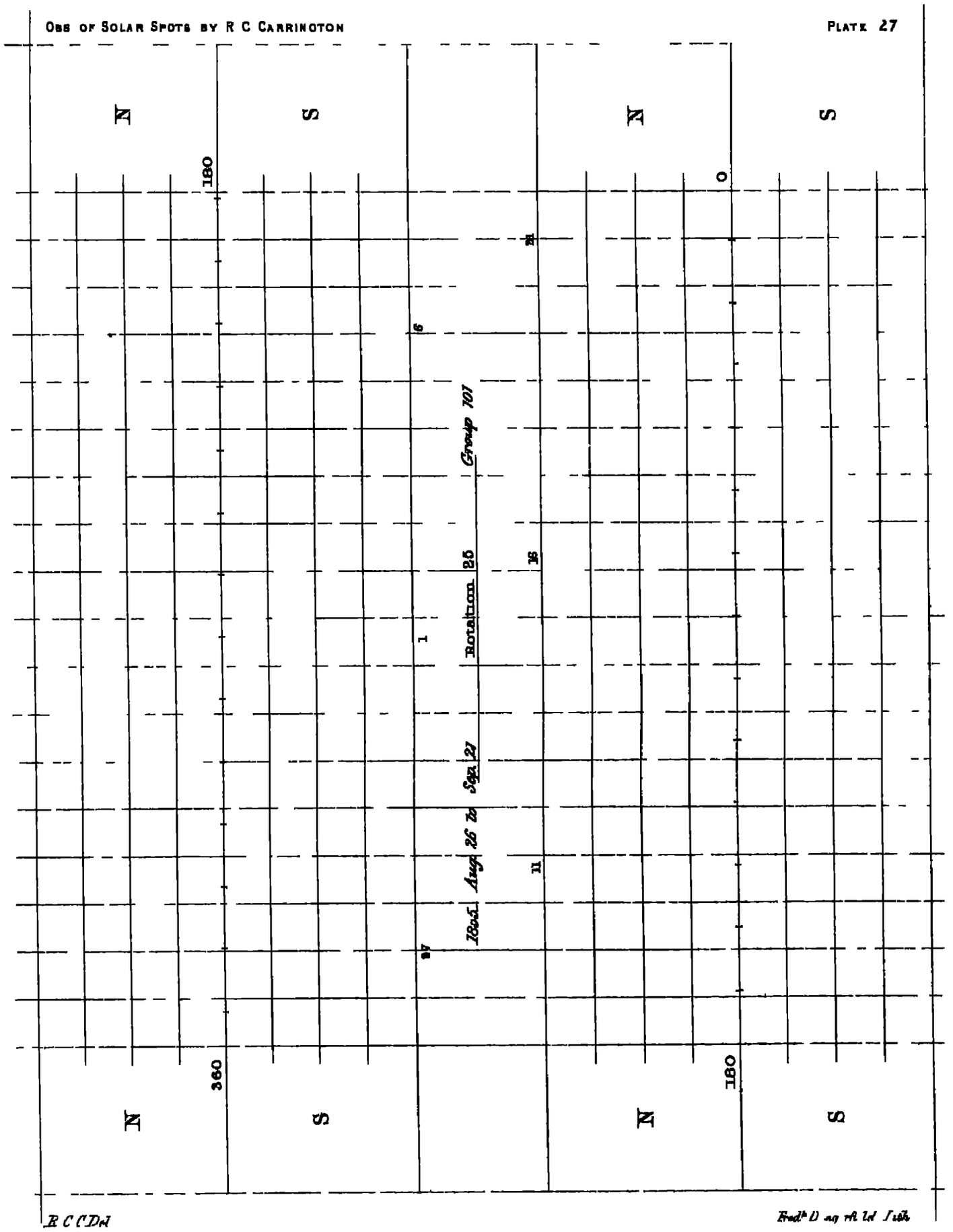


R C C D l

Fredk Dangerfield, Lith



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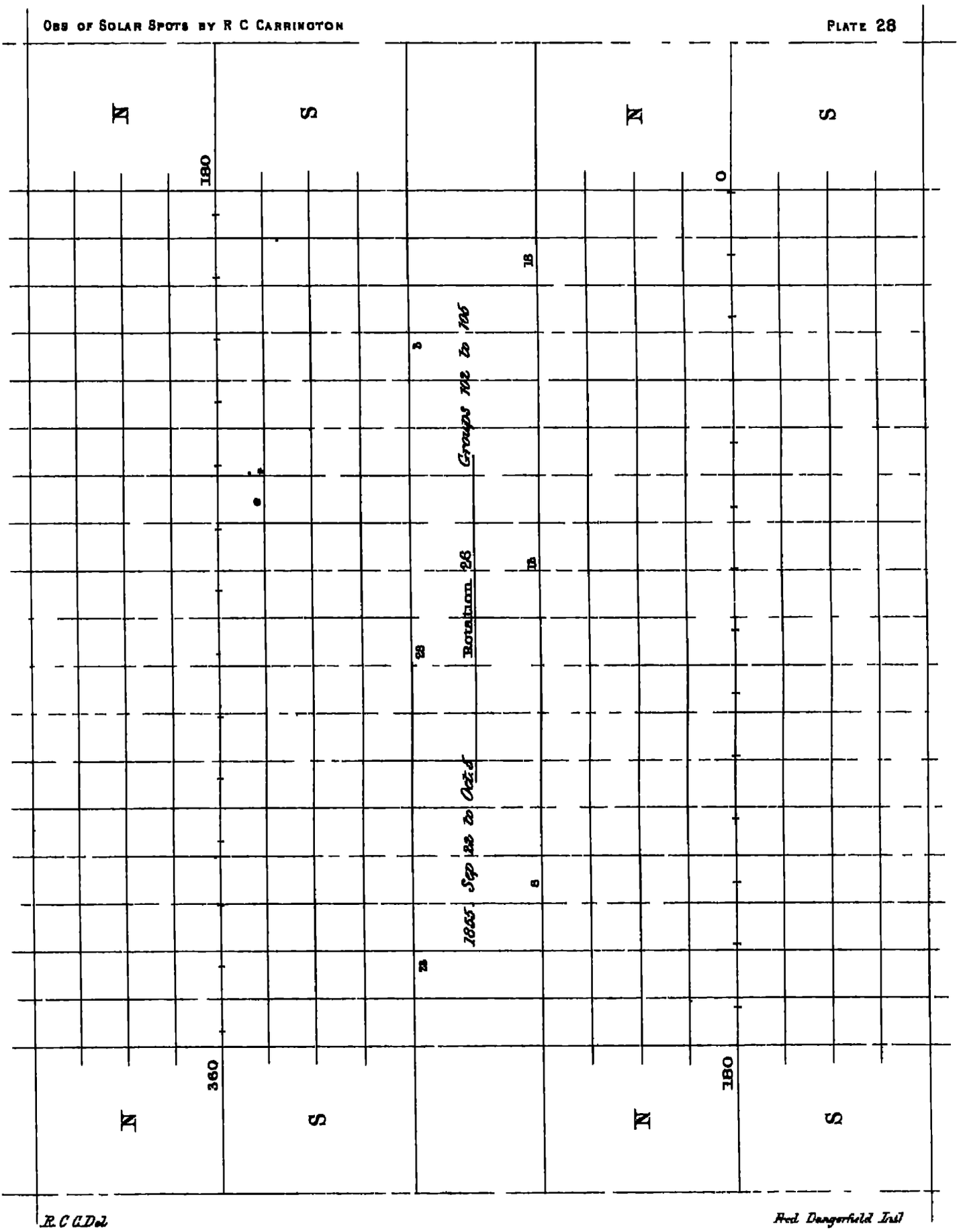
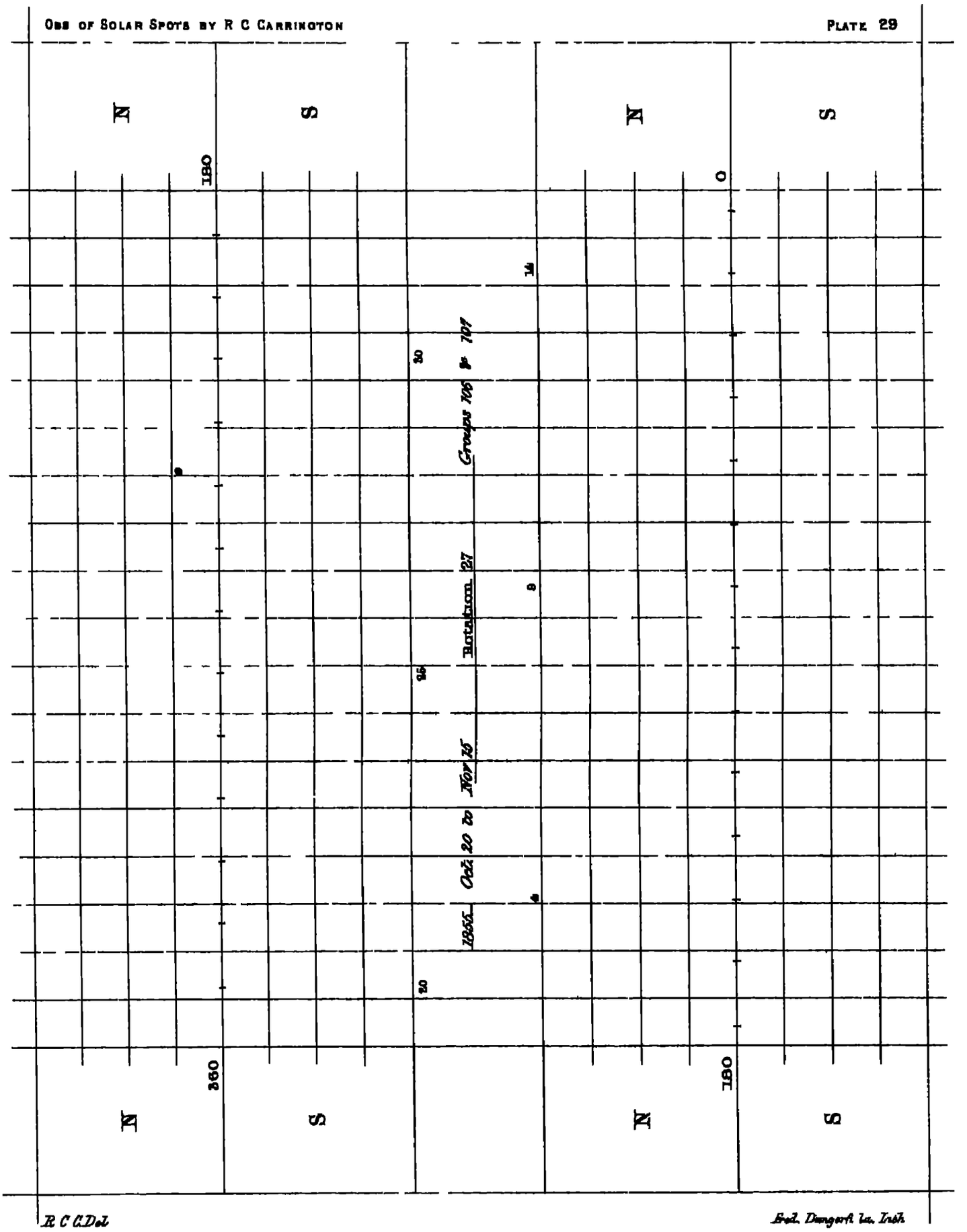


R. C. C. Del.

Fred Dangerfield Lith



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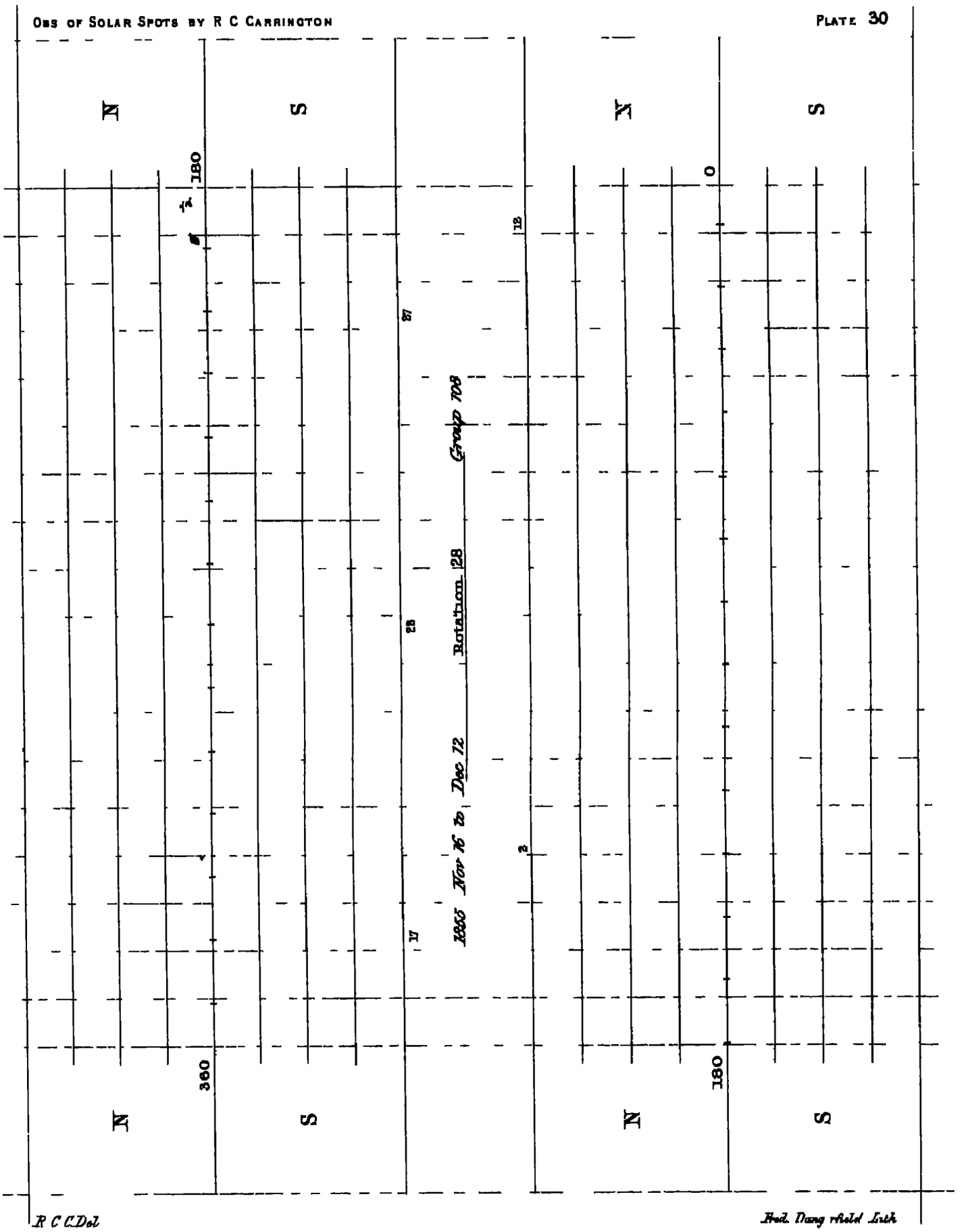

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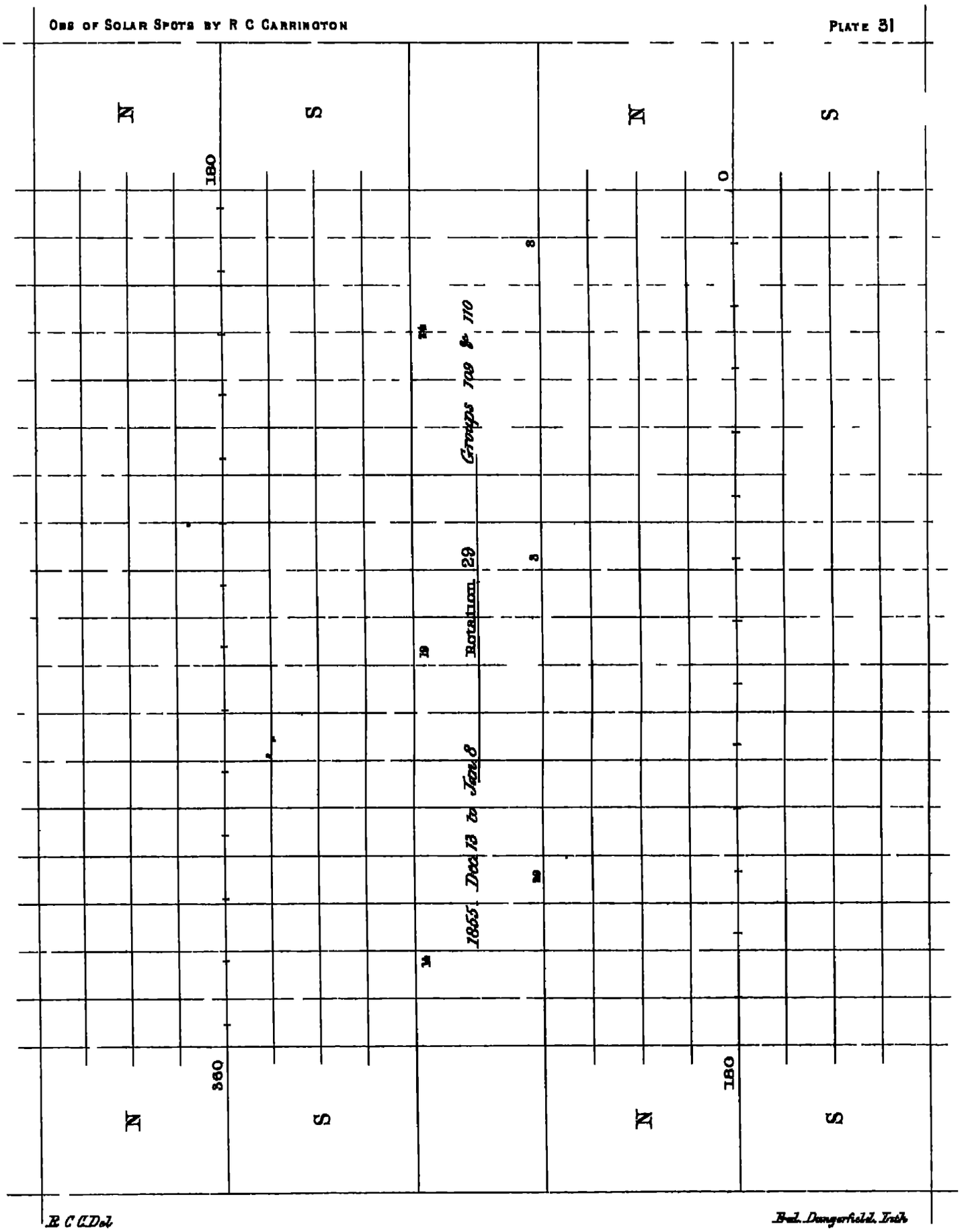
Fred. Dangerfield Lith



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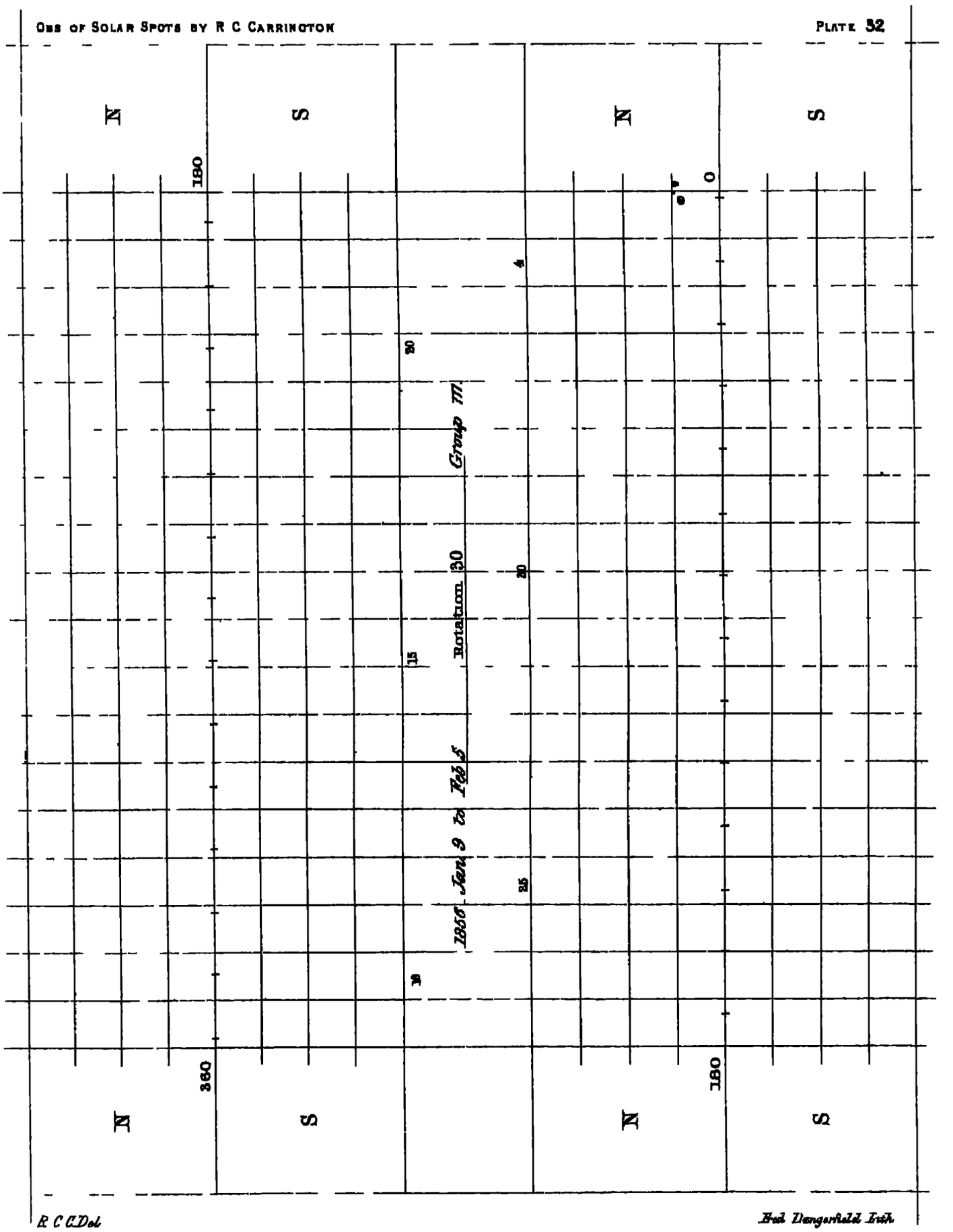
Fred. Dangerfield. Lith



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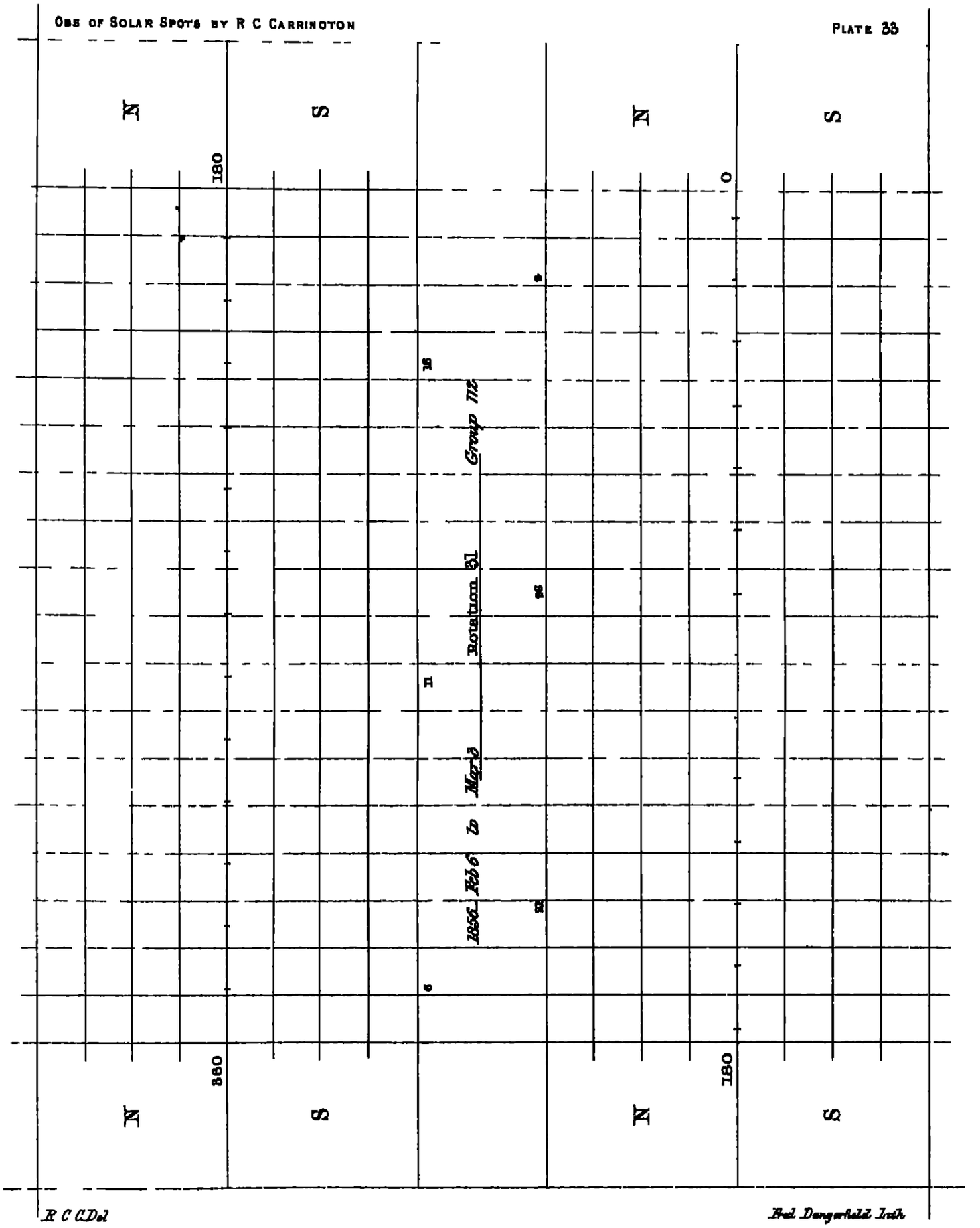

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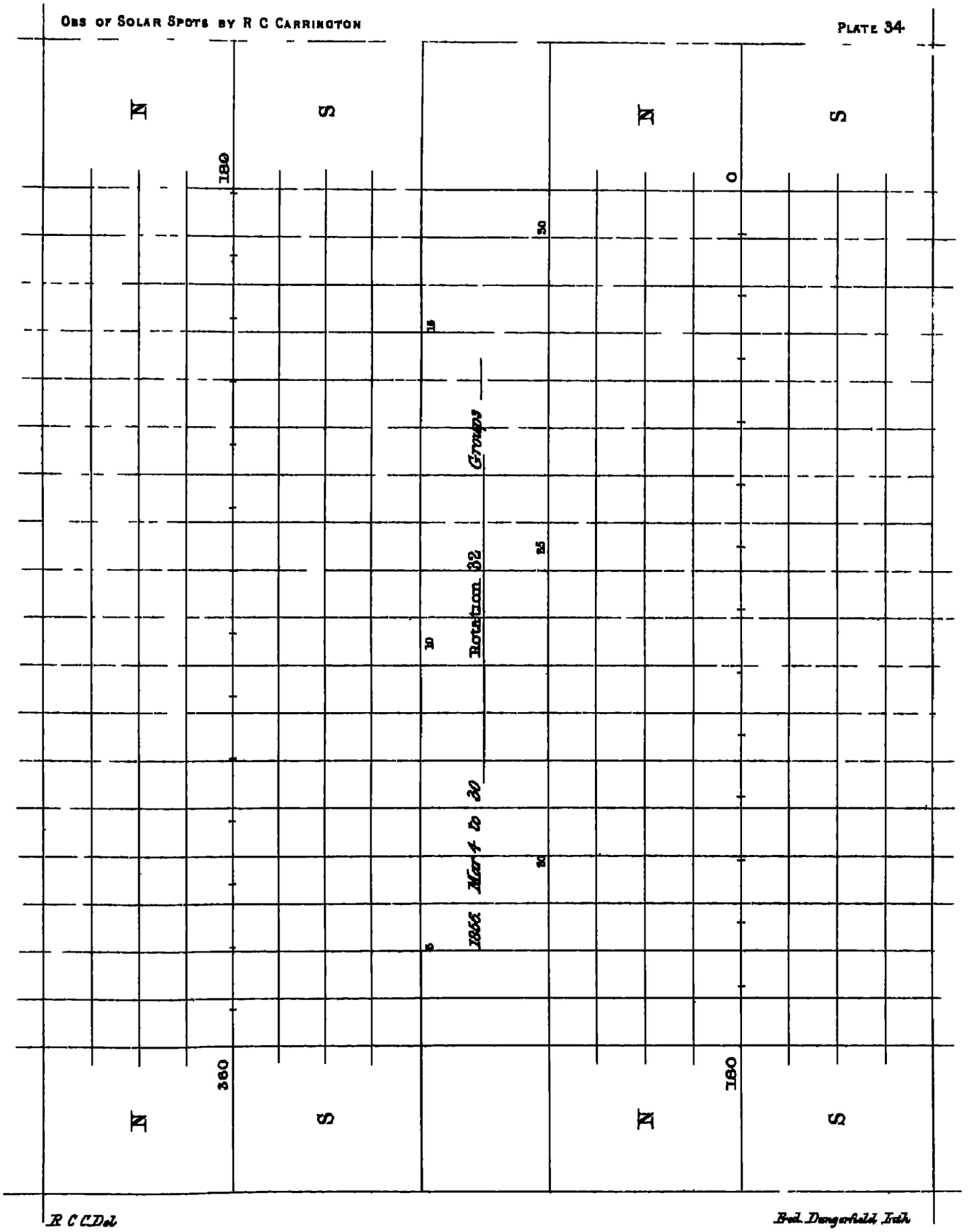
Fred Dangerfield Lith



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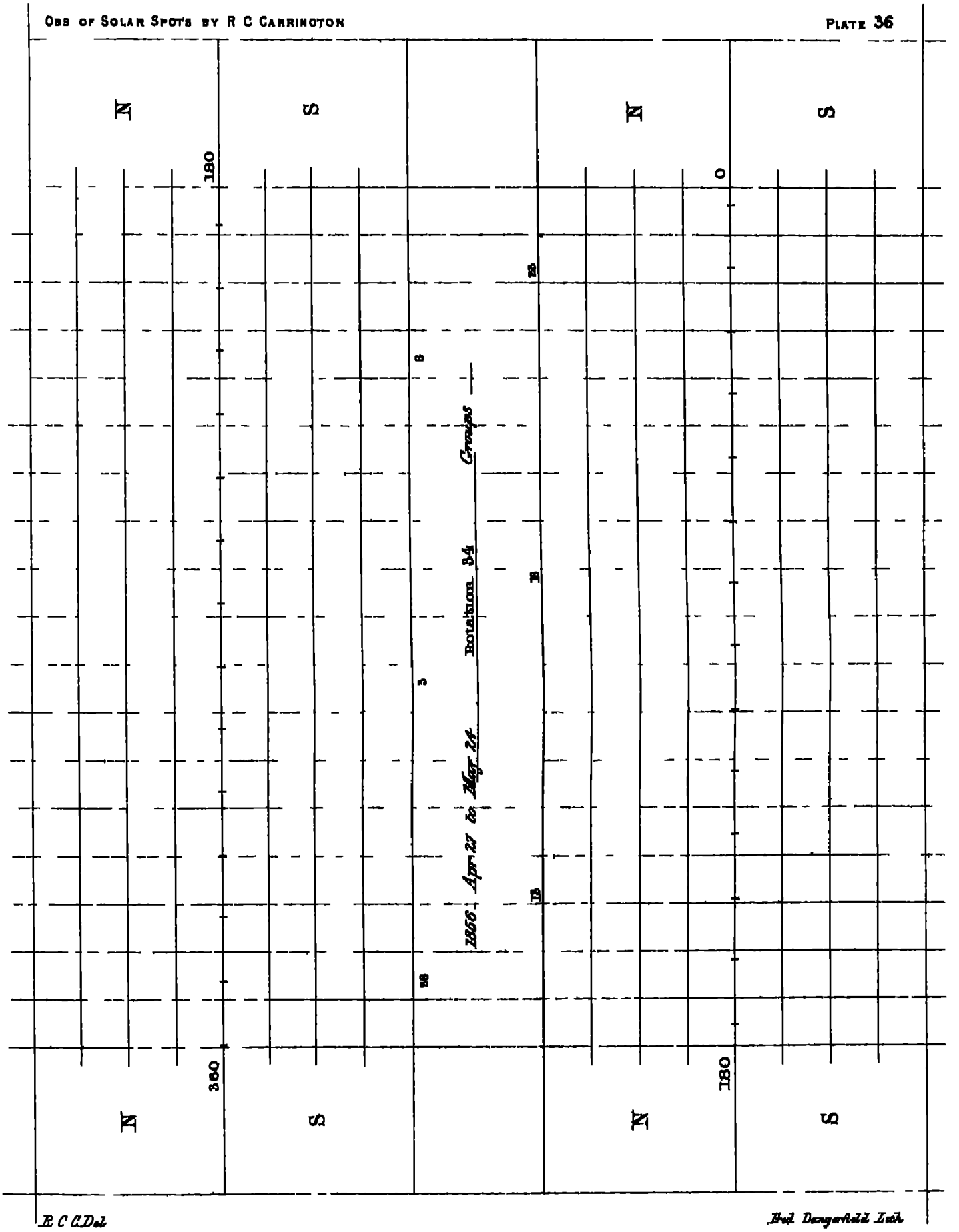
Fred. Dangerfield Lith



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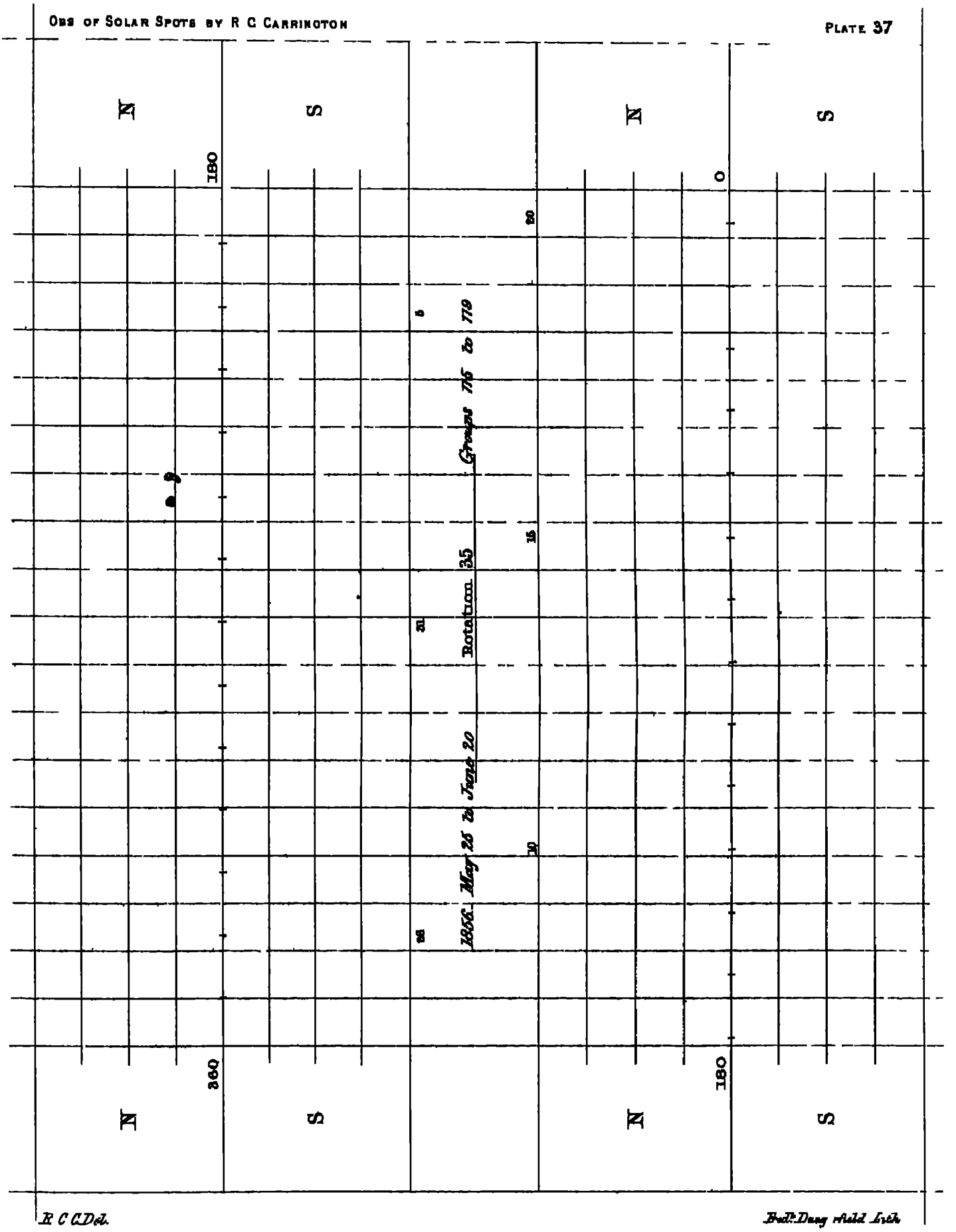

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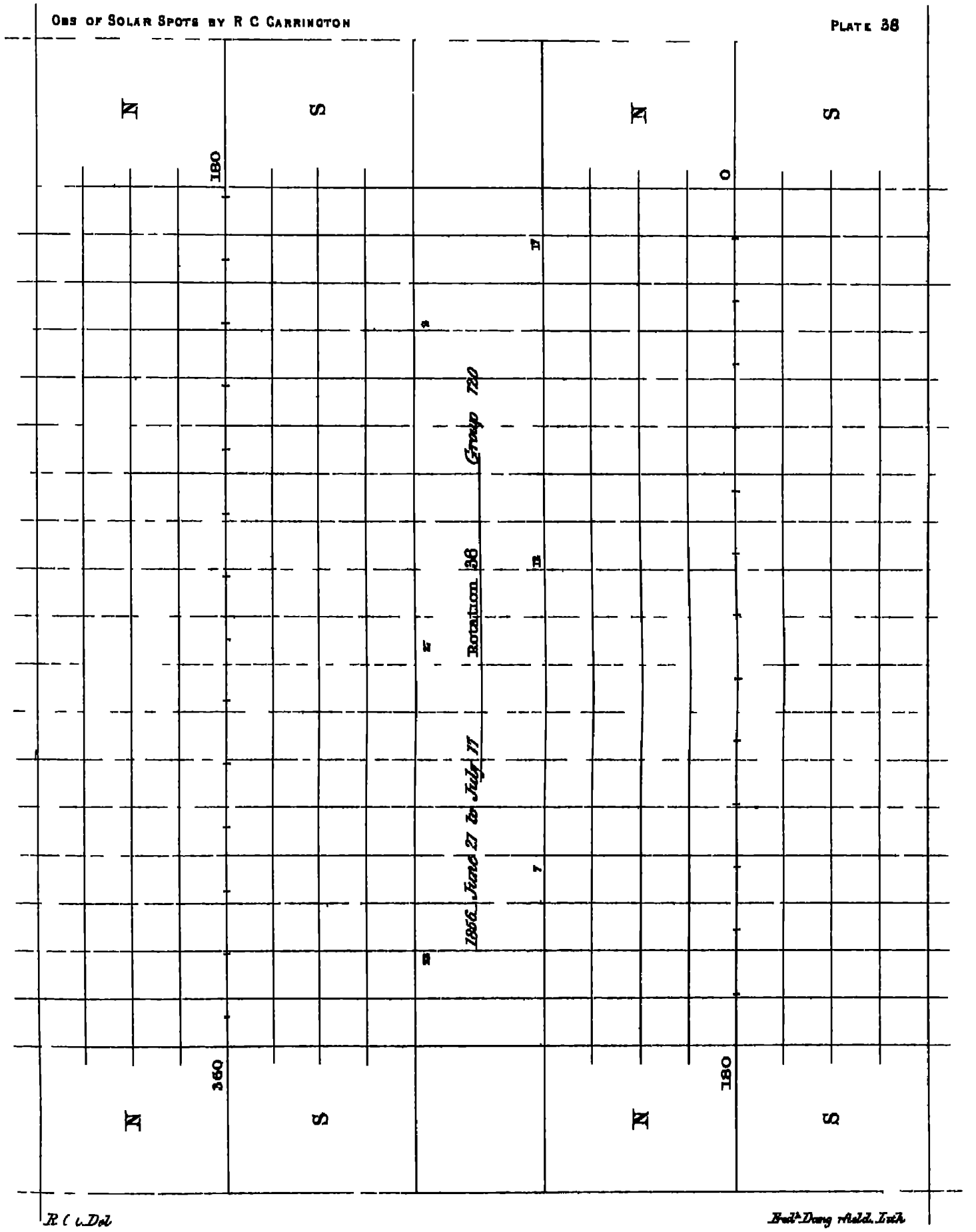

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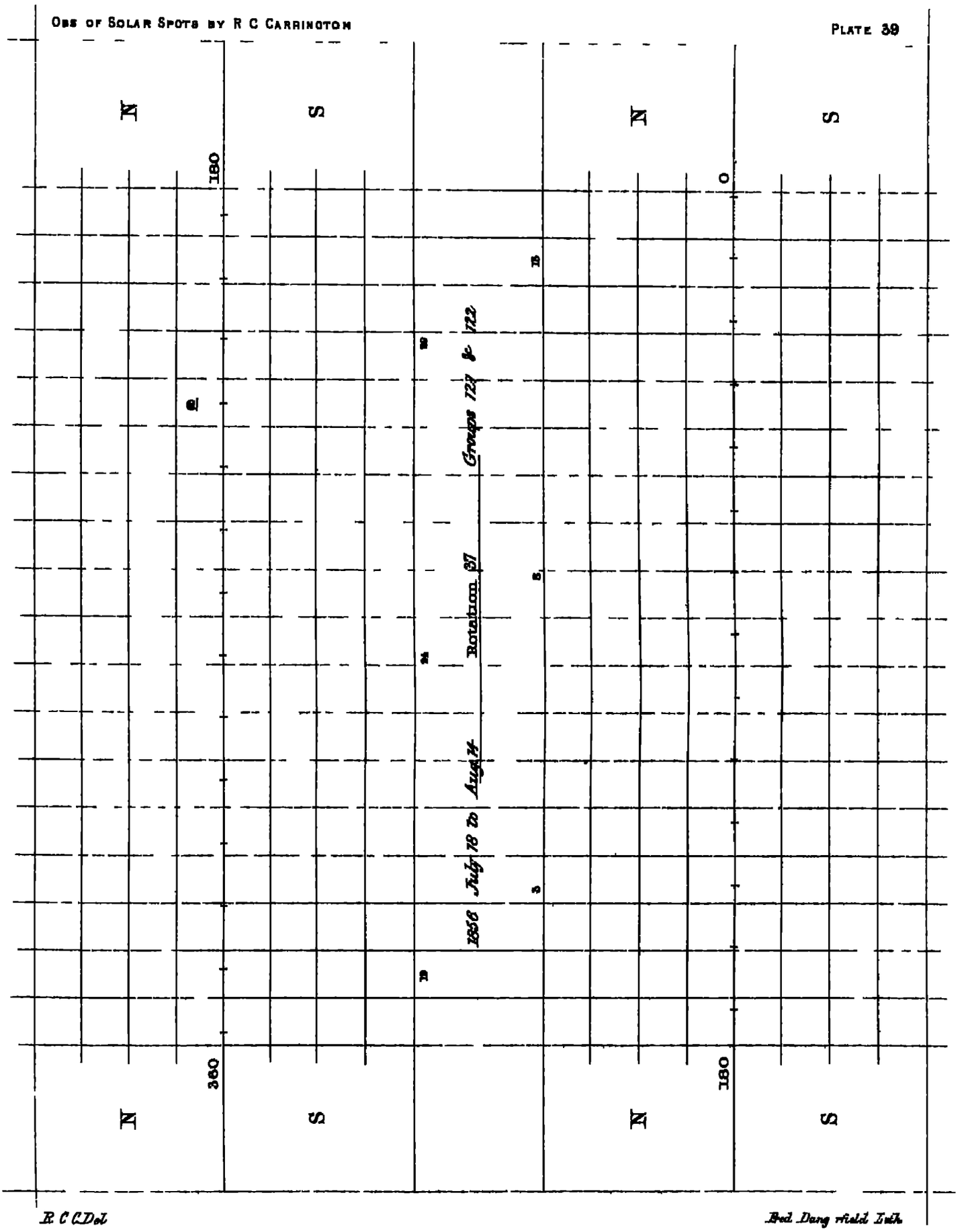

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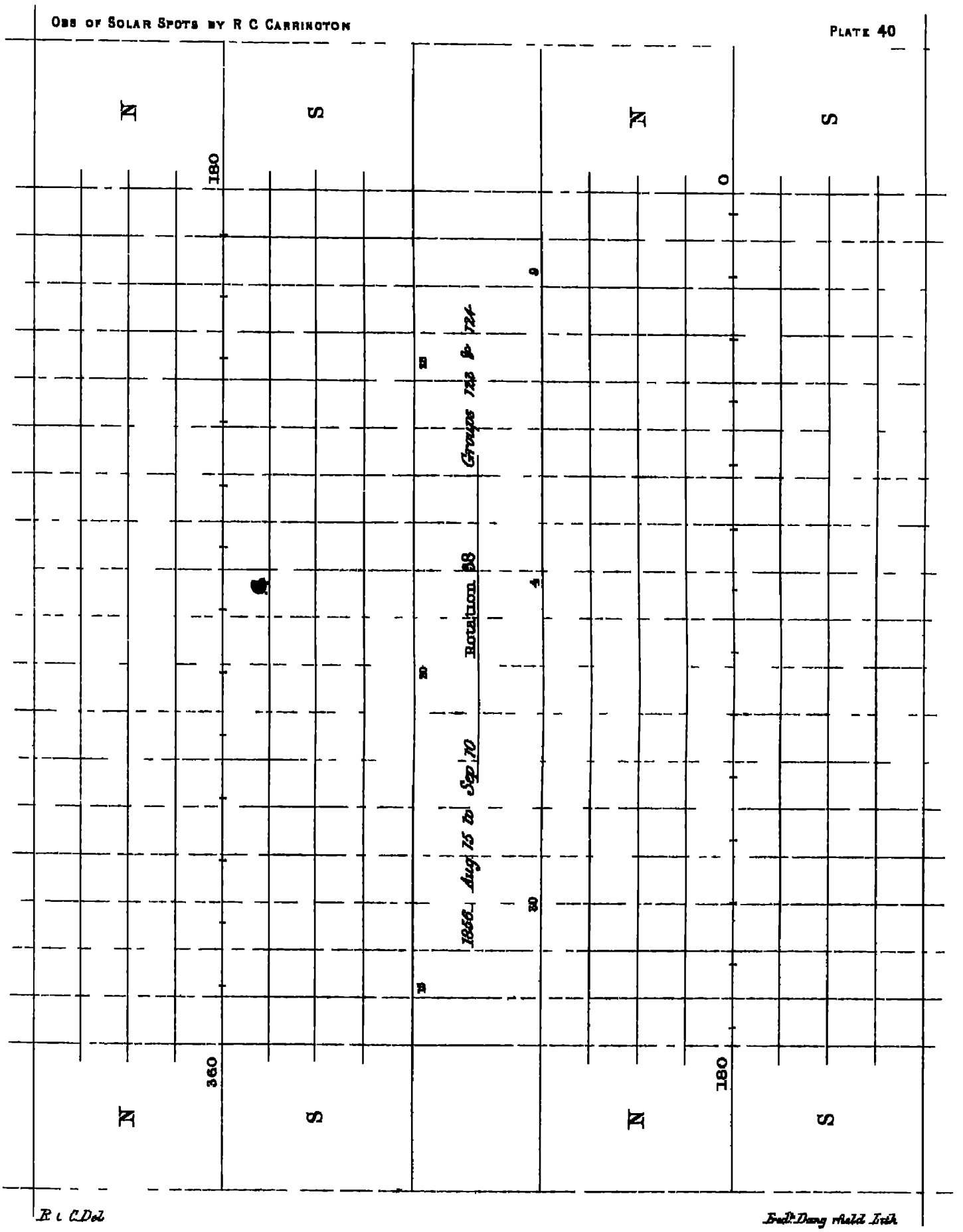

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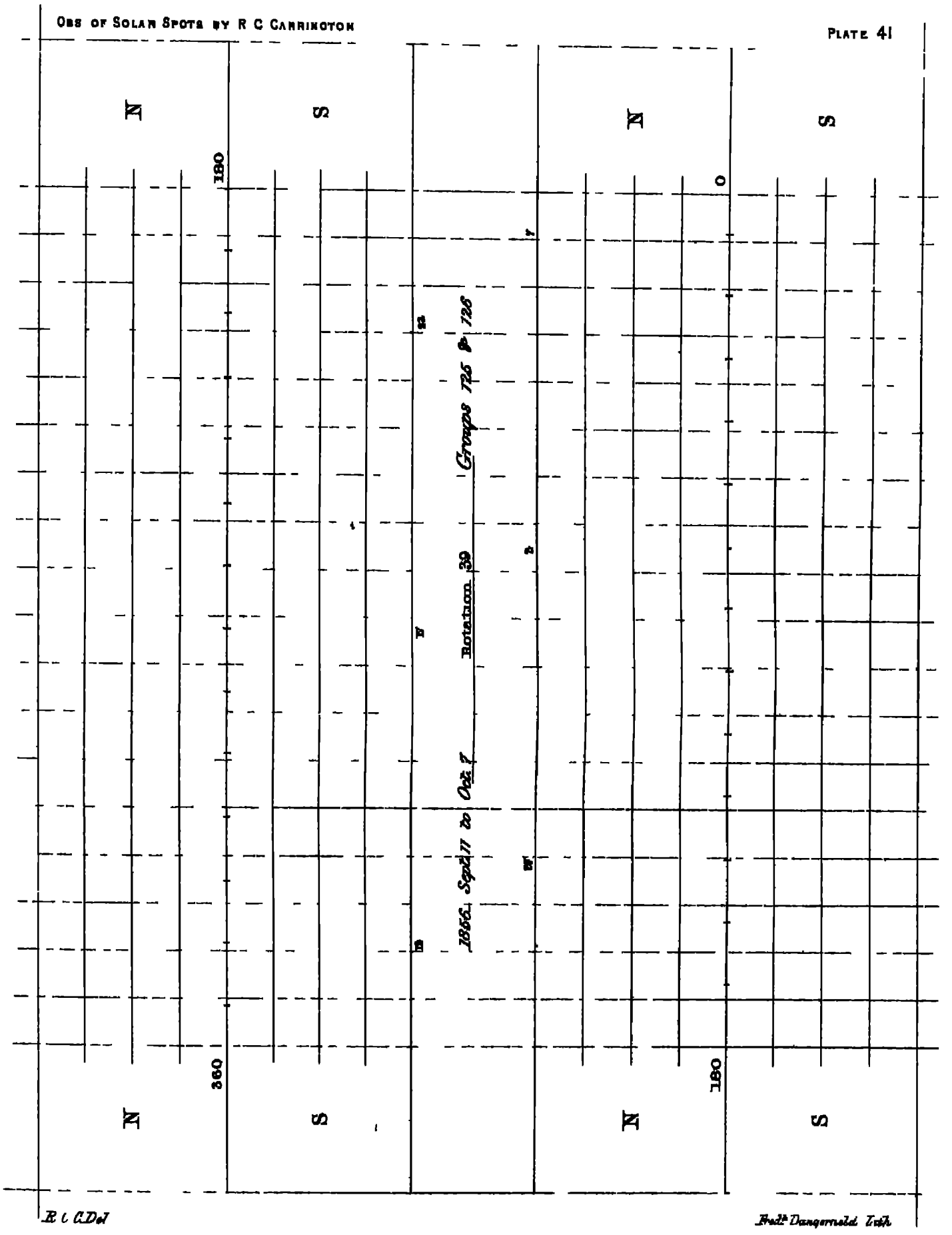

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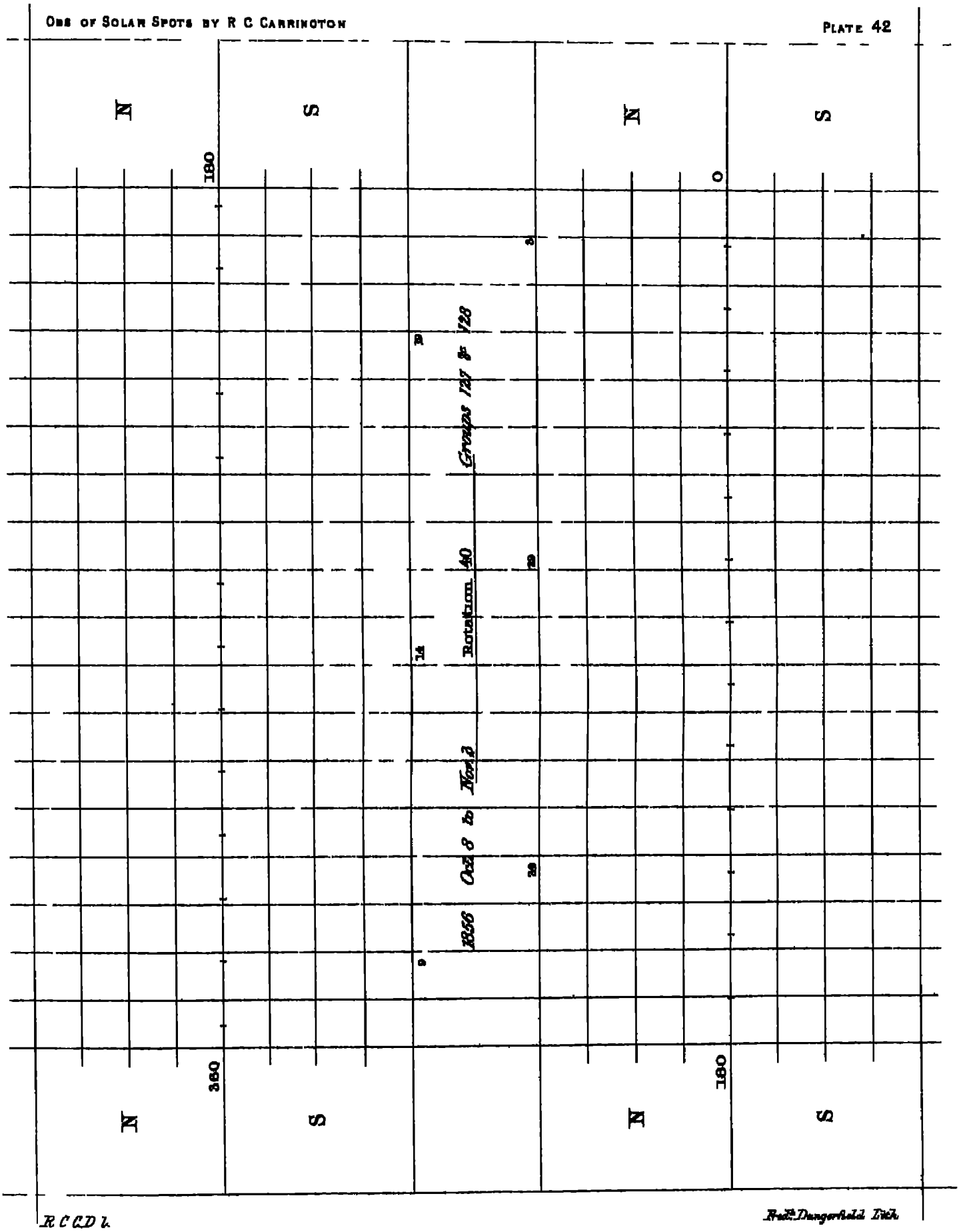

R C C D l.

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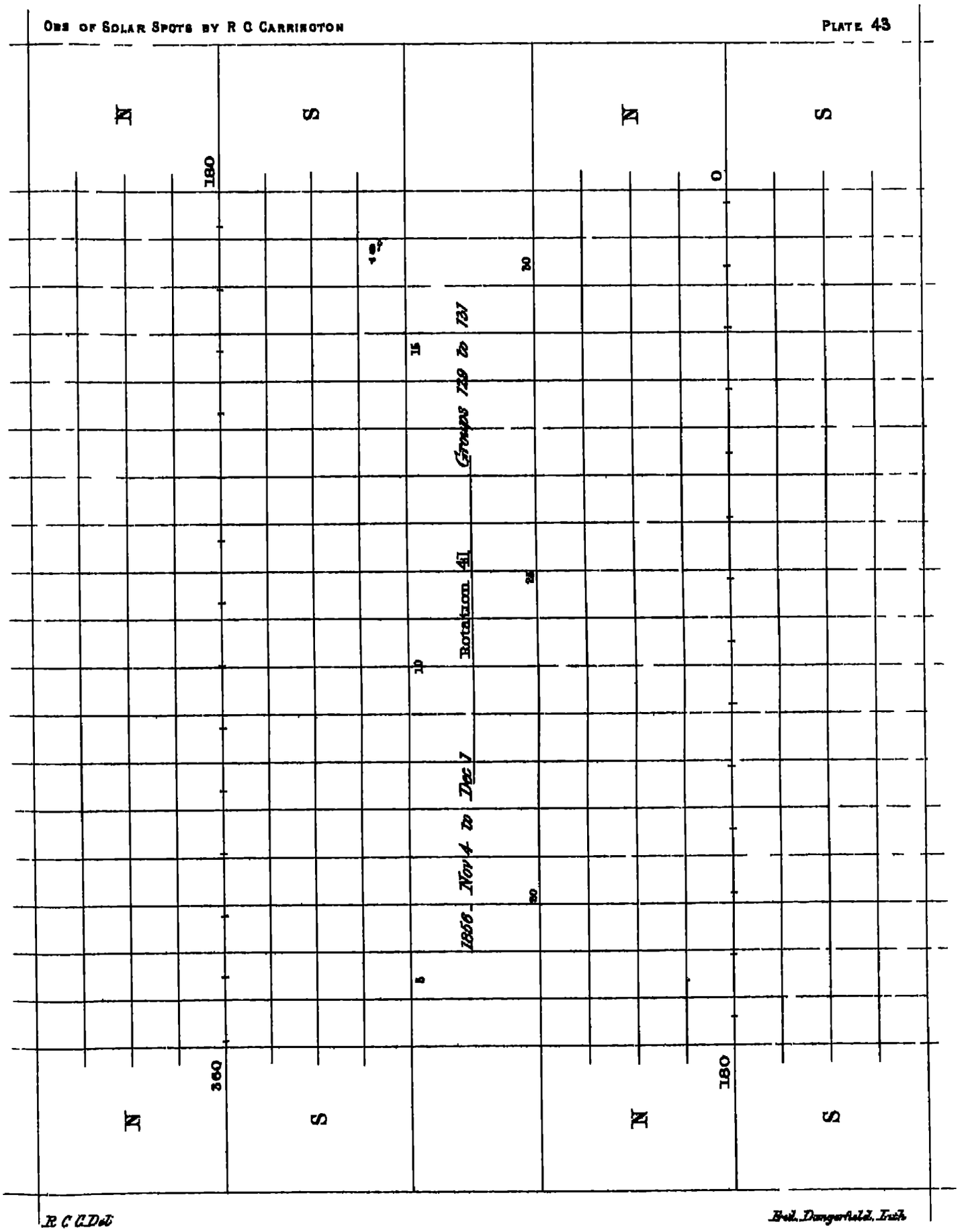
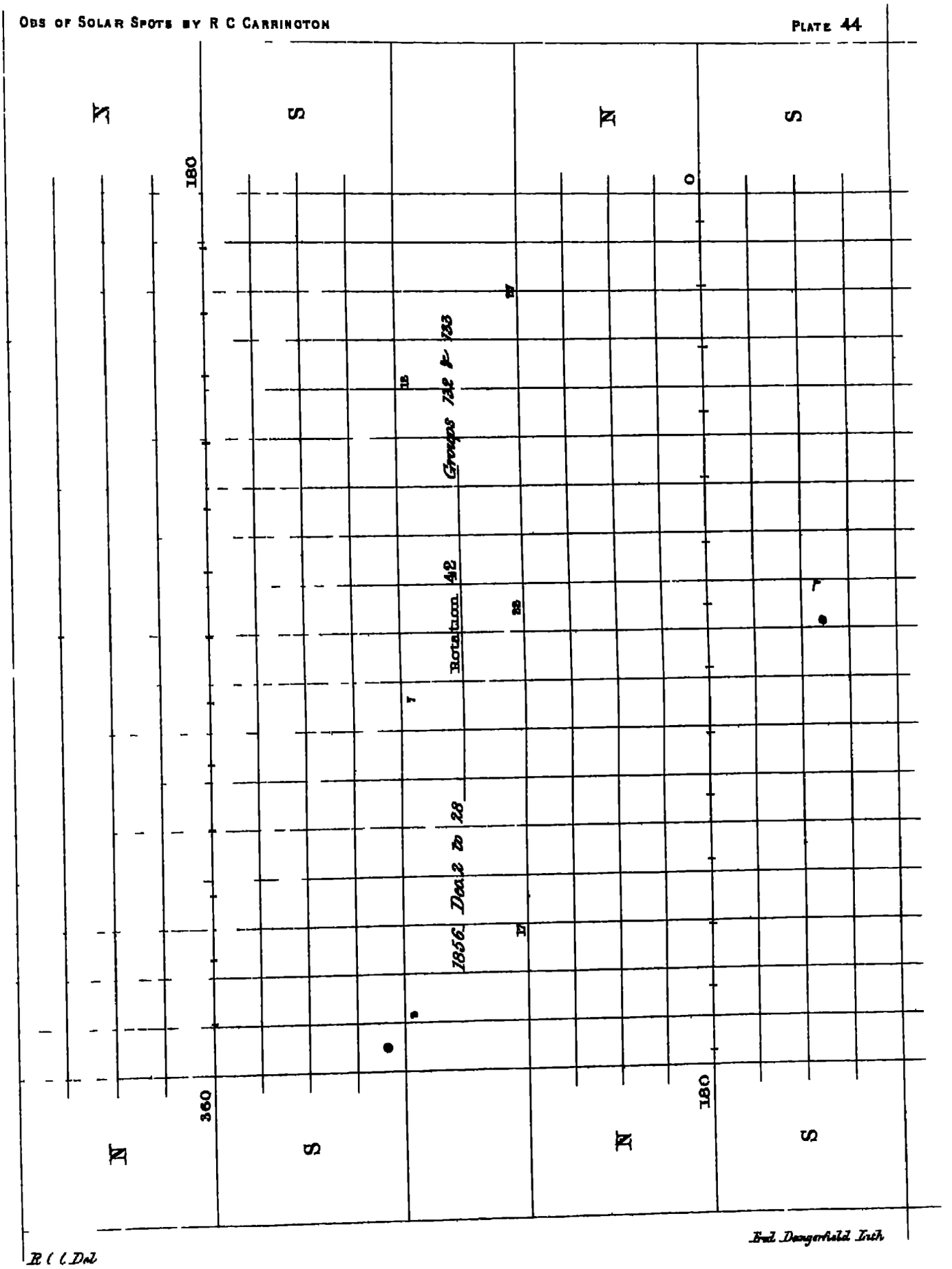


R C C Del

Fred. Dangerfield, Lith



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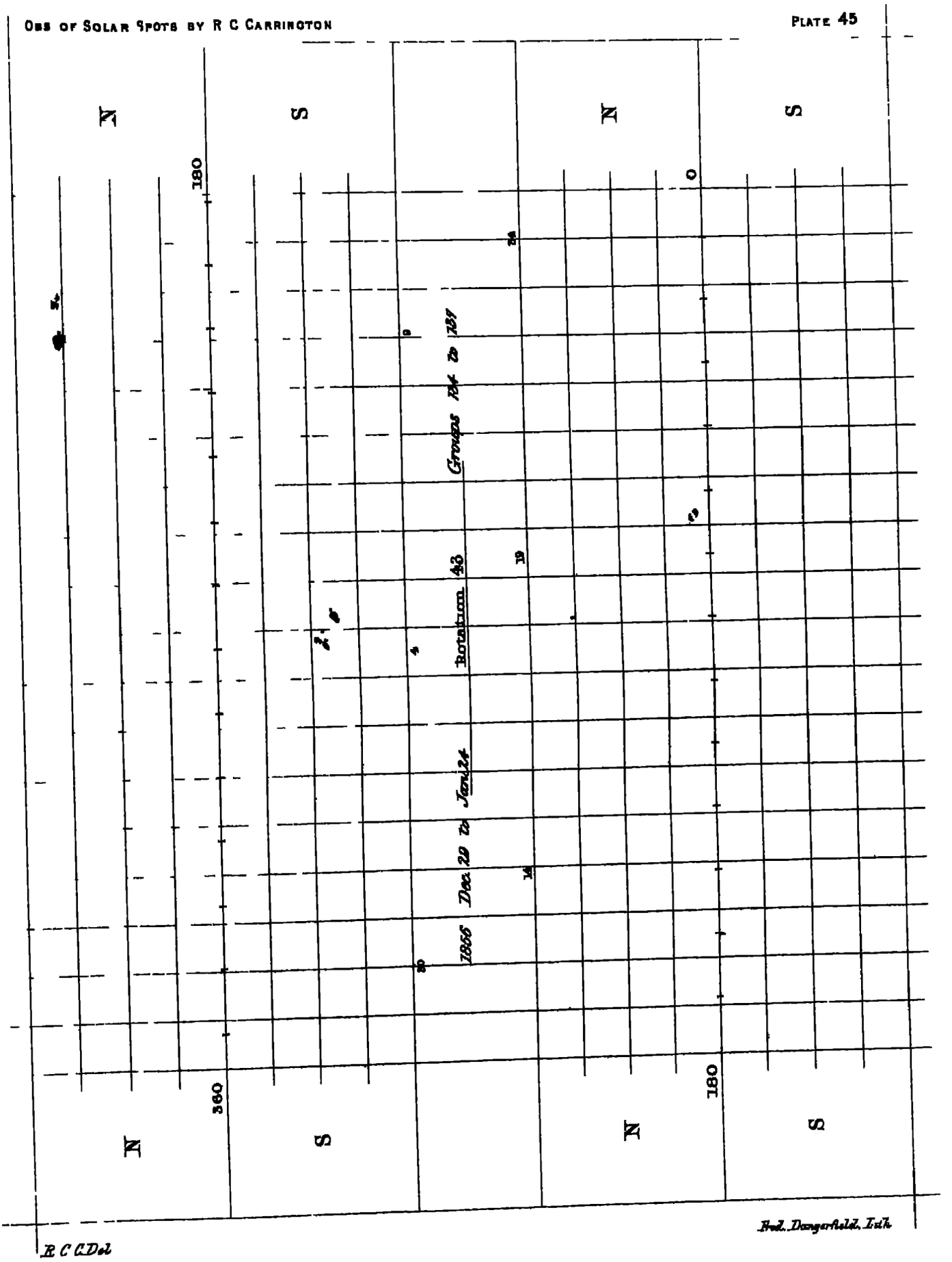
Fred Dangerfield Lith



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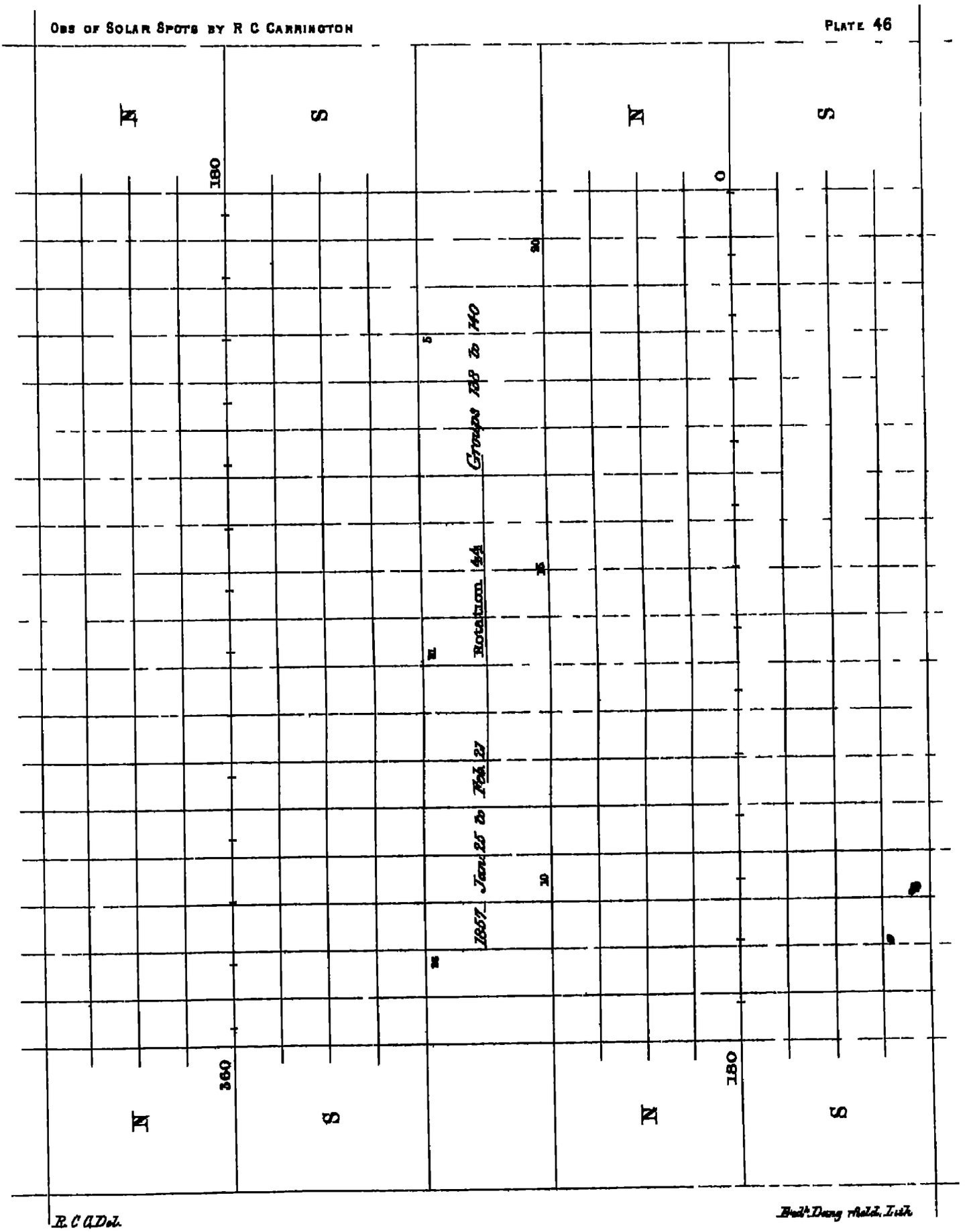
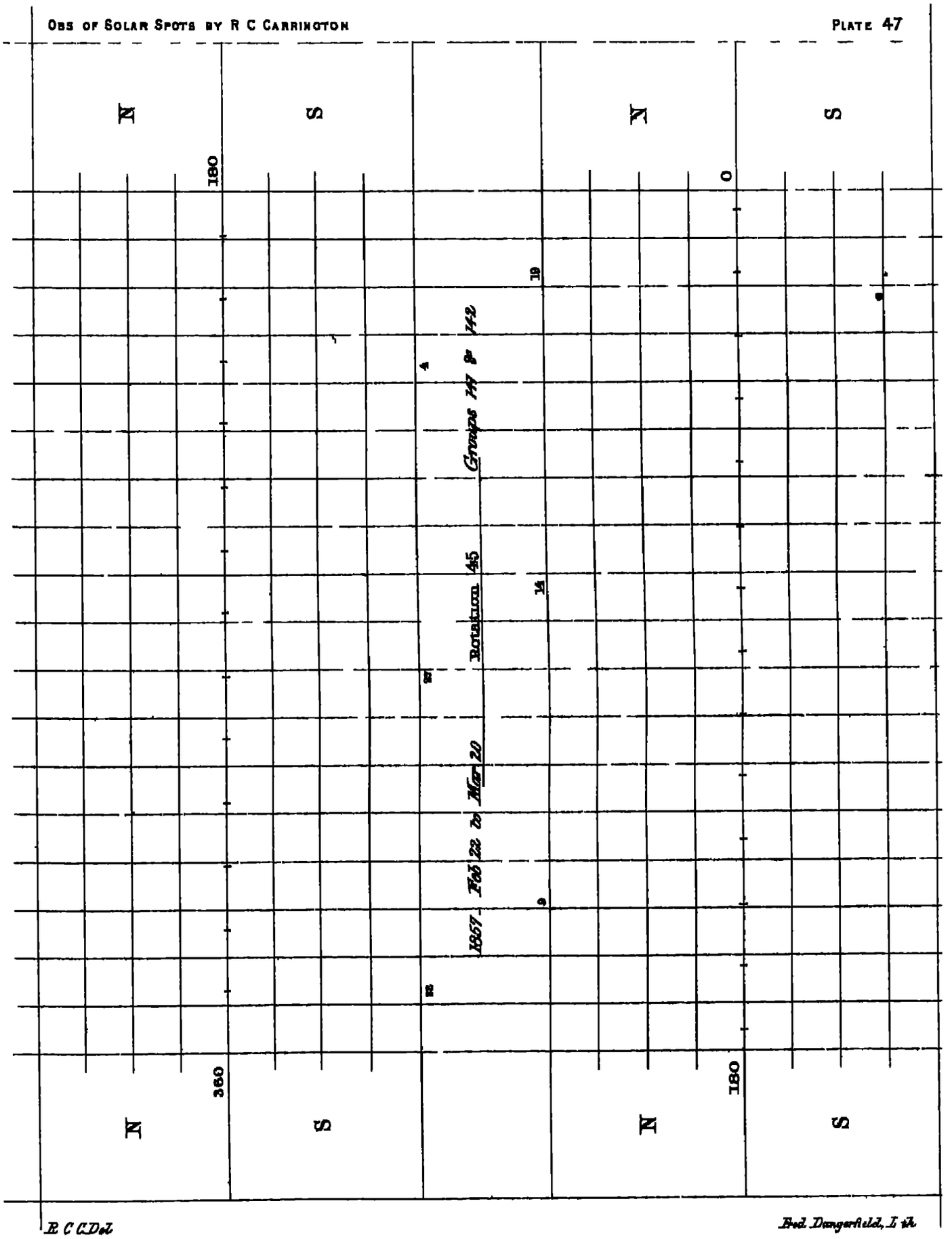


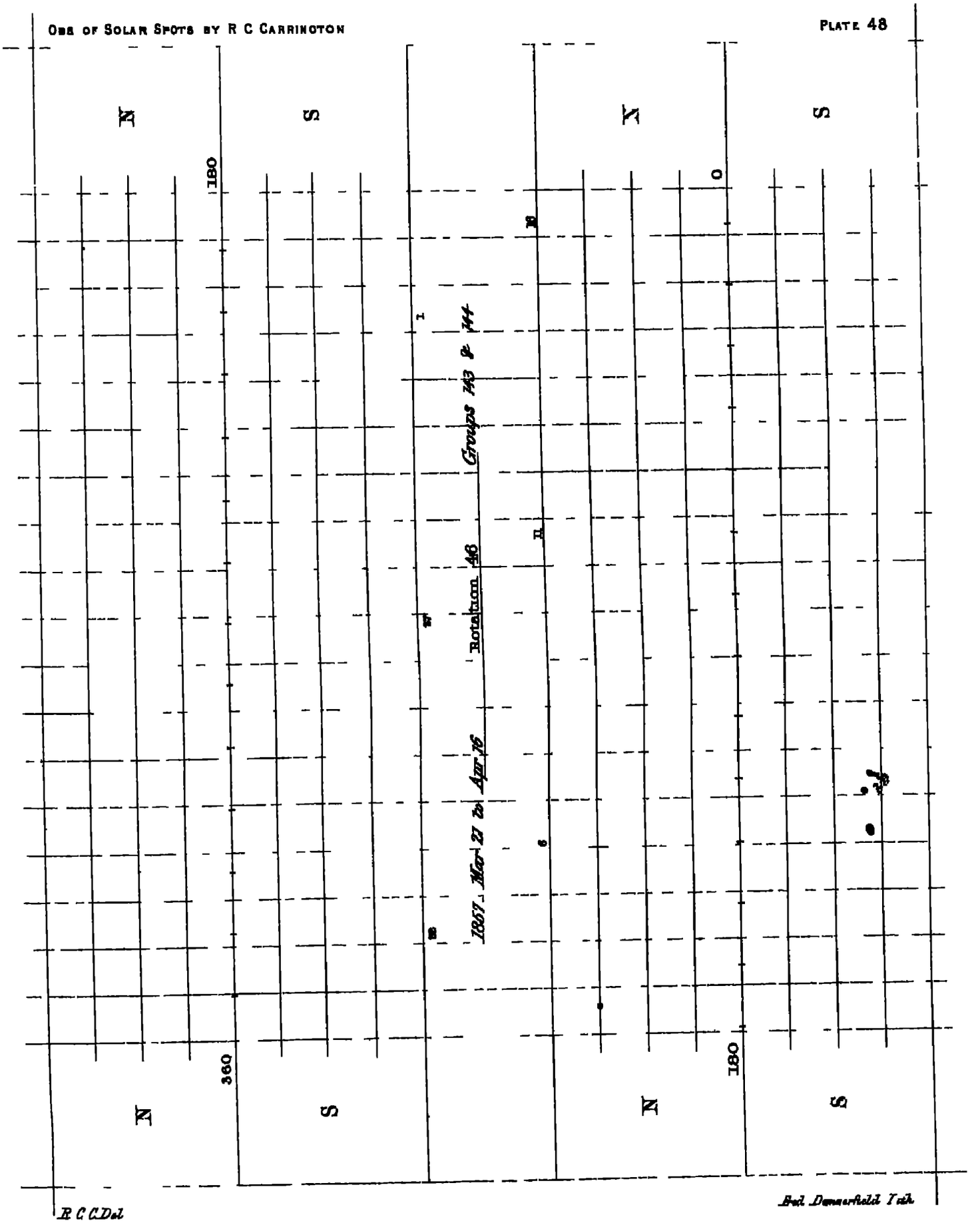
R. C. A. Del.

Eng'd Dang rfield, Lith.



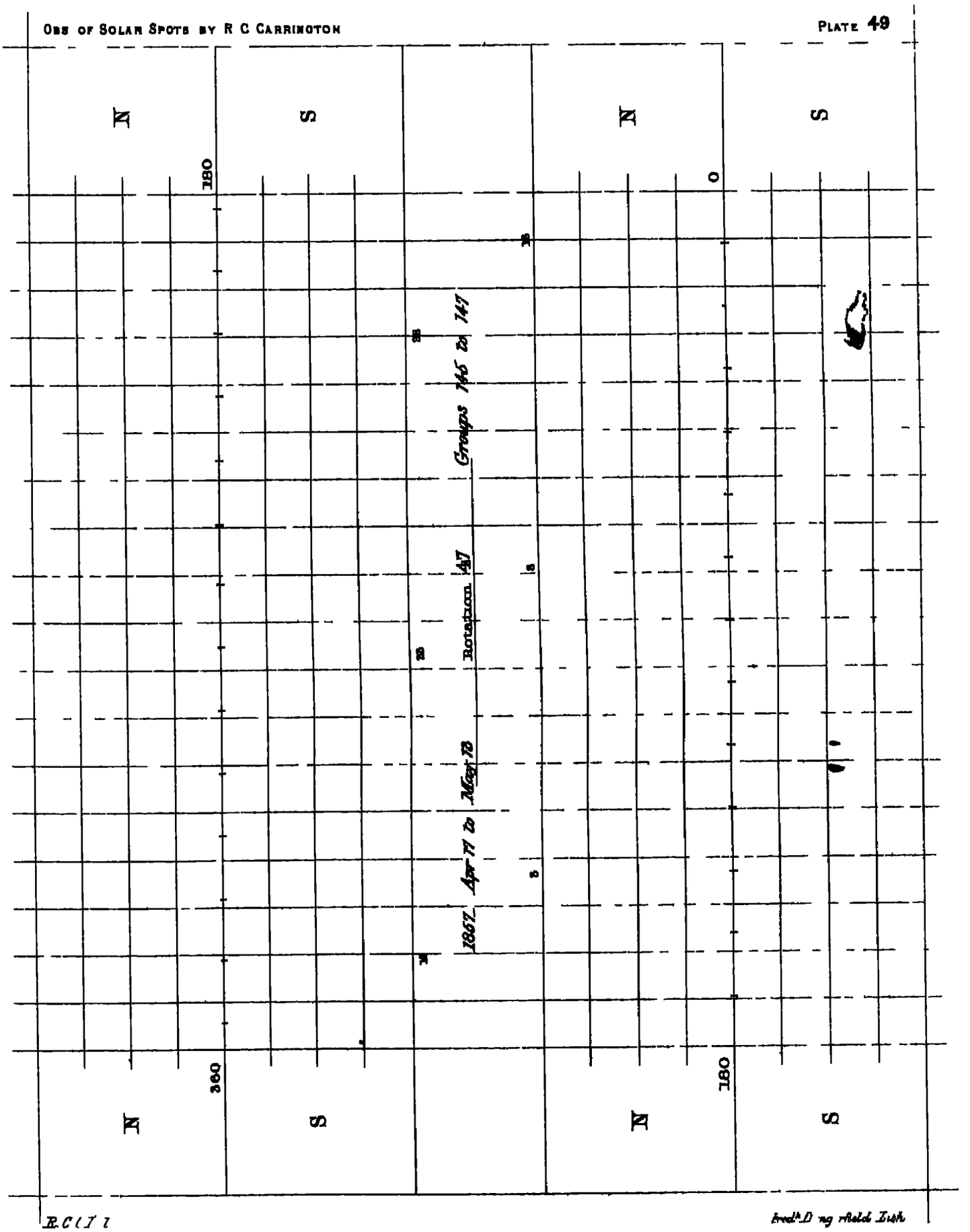
R C C Del

Fred Dangerfield, Lith



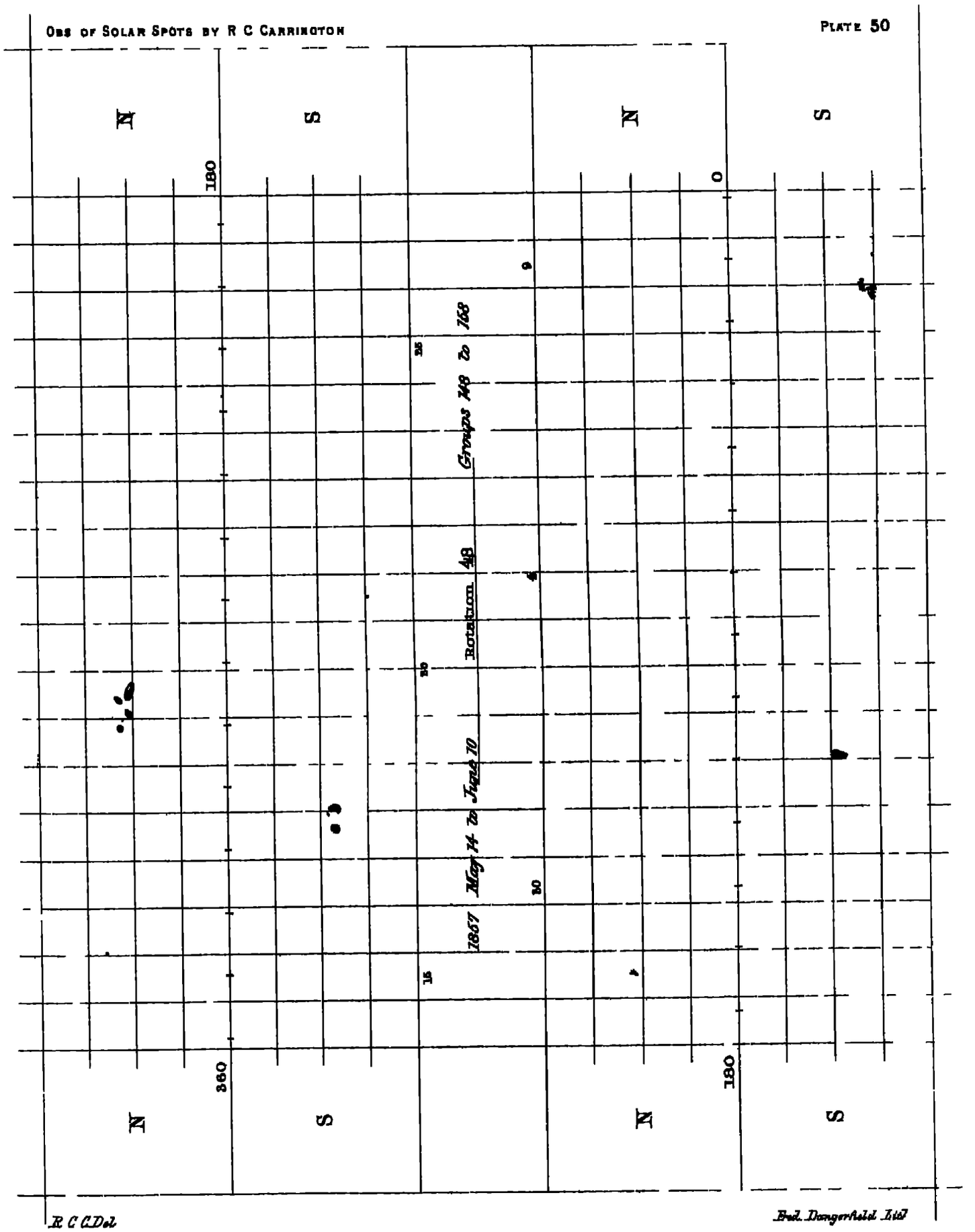
R C C Del

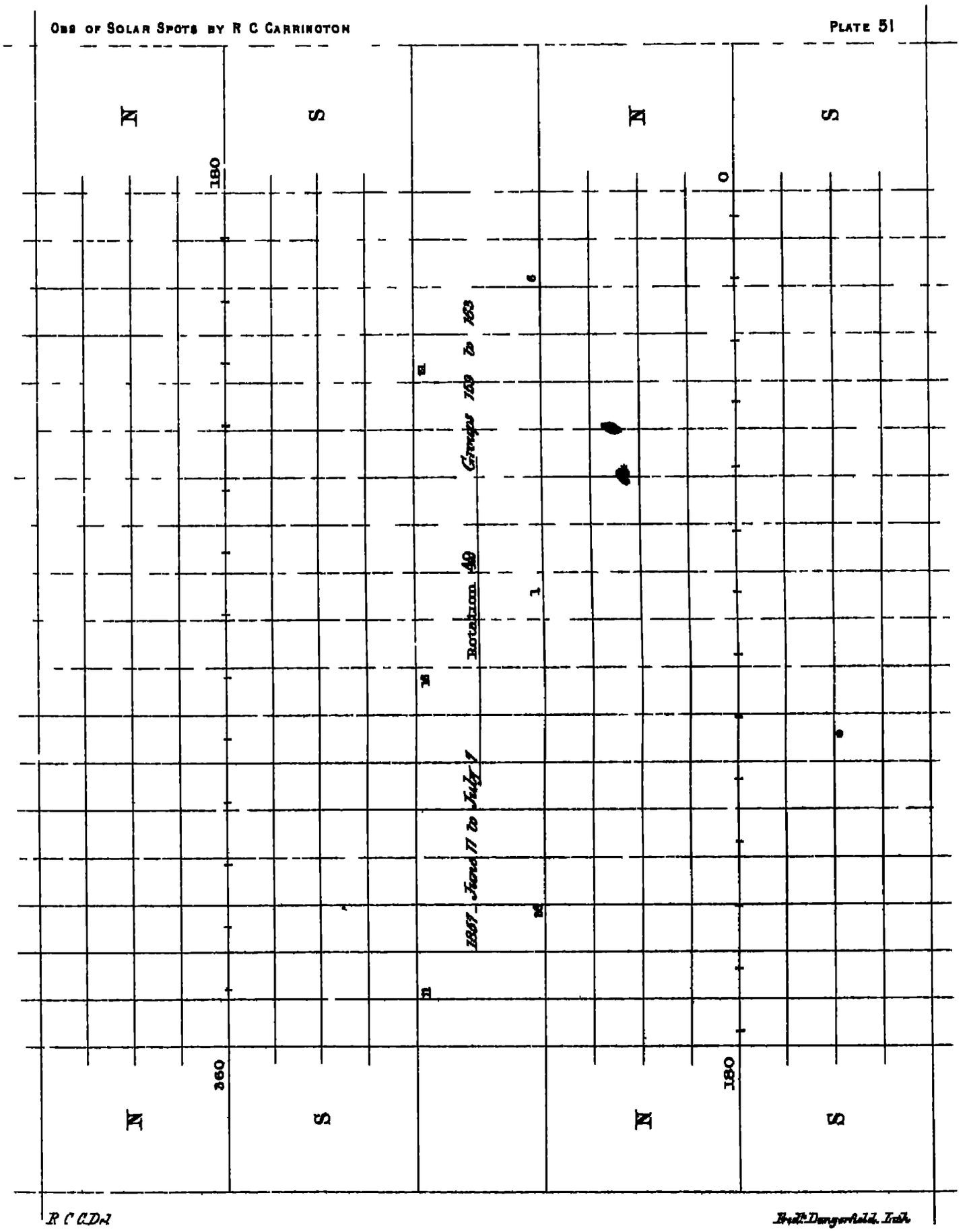
Fred Dansenfield Lith



R.C.C.I.

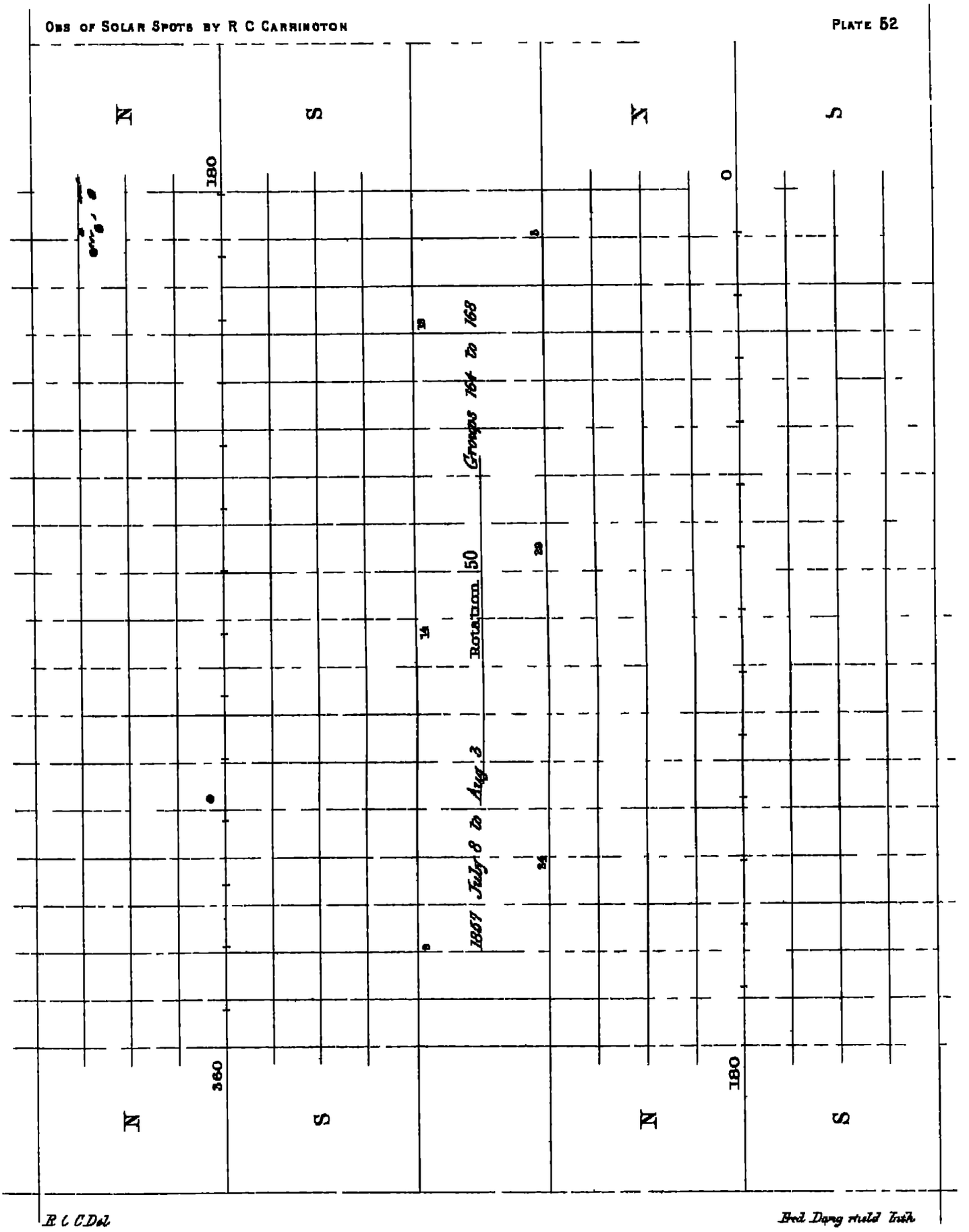
Fredk Dangerfield Lith


N
S
N
S
180
0
360
180
Groups 748 to 768
Rotation 48
1857 May 14 to June 10
R C C.Del.
Fred. Dangerfield Lith.



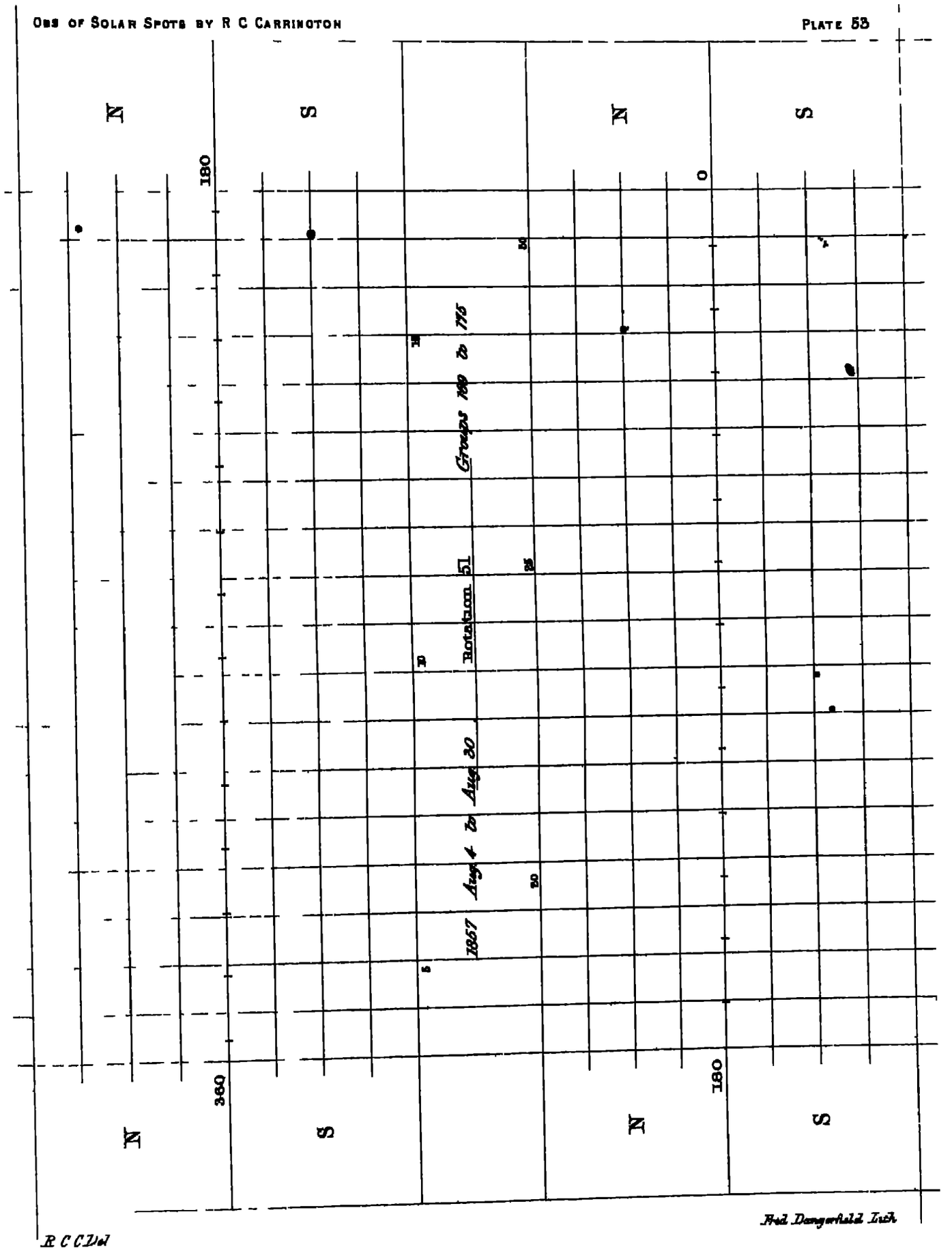
R C C.Del

Fredk Dangerfield, Lith.



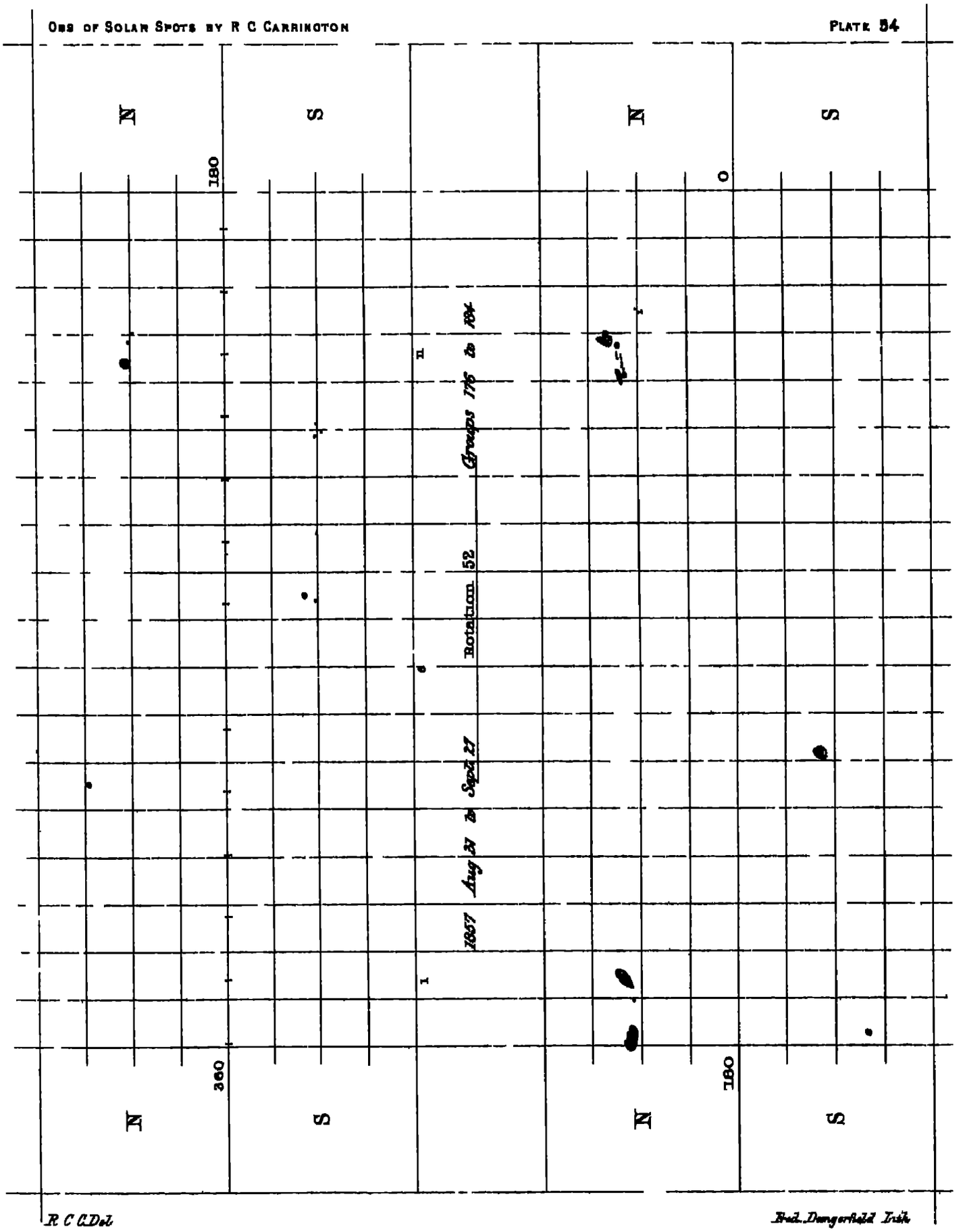
R C C Del

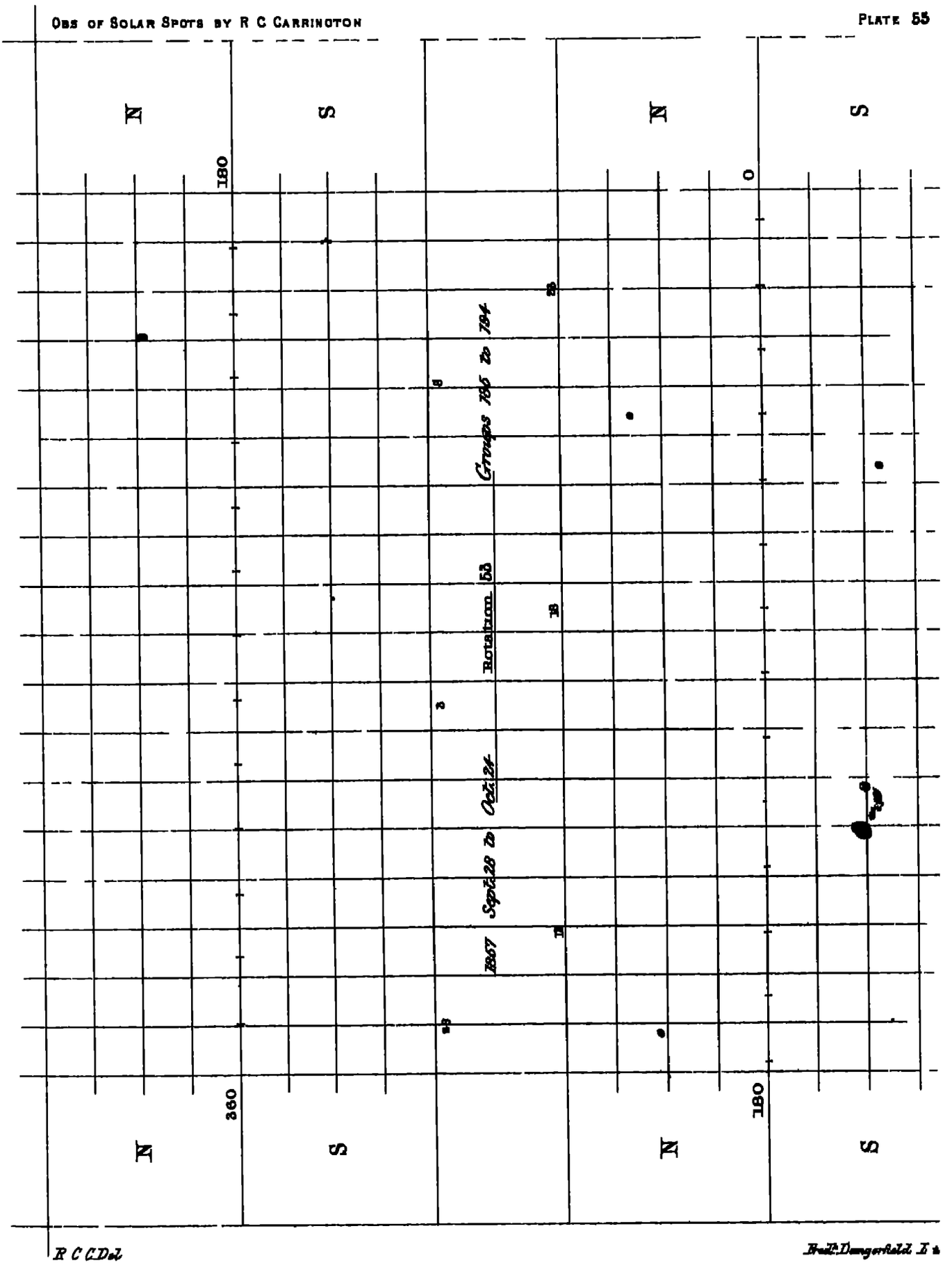
Fred Dangerfield Lith



R C C Del

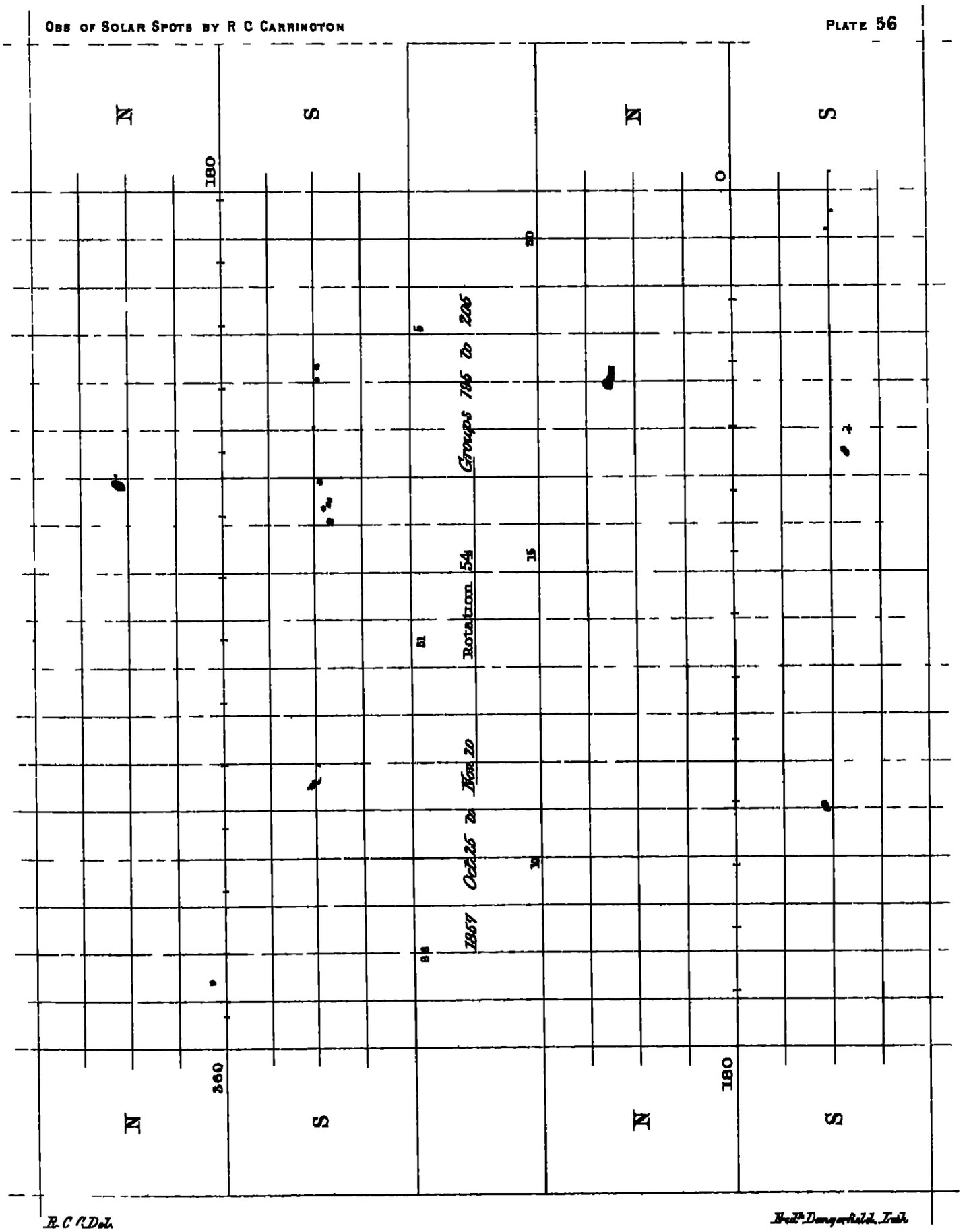
Fred Dangerfield Lith


N
S
N
S
180
0
360
180
Groups 176 to 184
Rotation 52
1857 Aug 27 to Sept 27
R C C.Del.
Bud. Dangerfield Irish



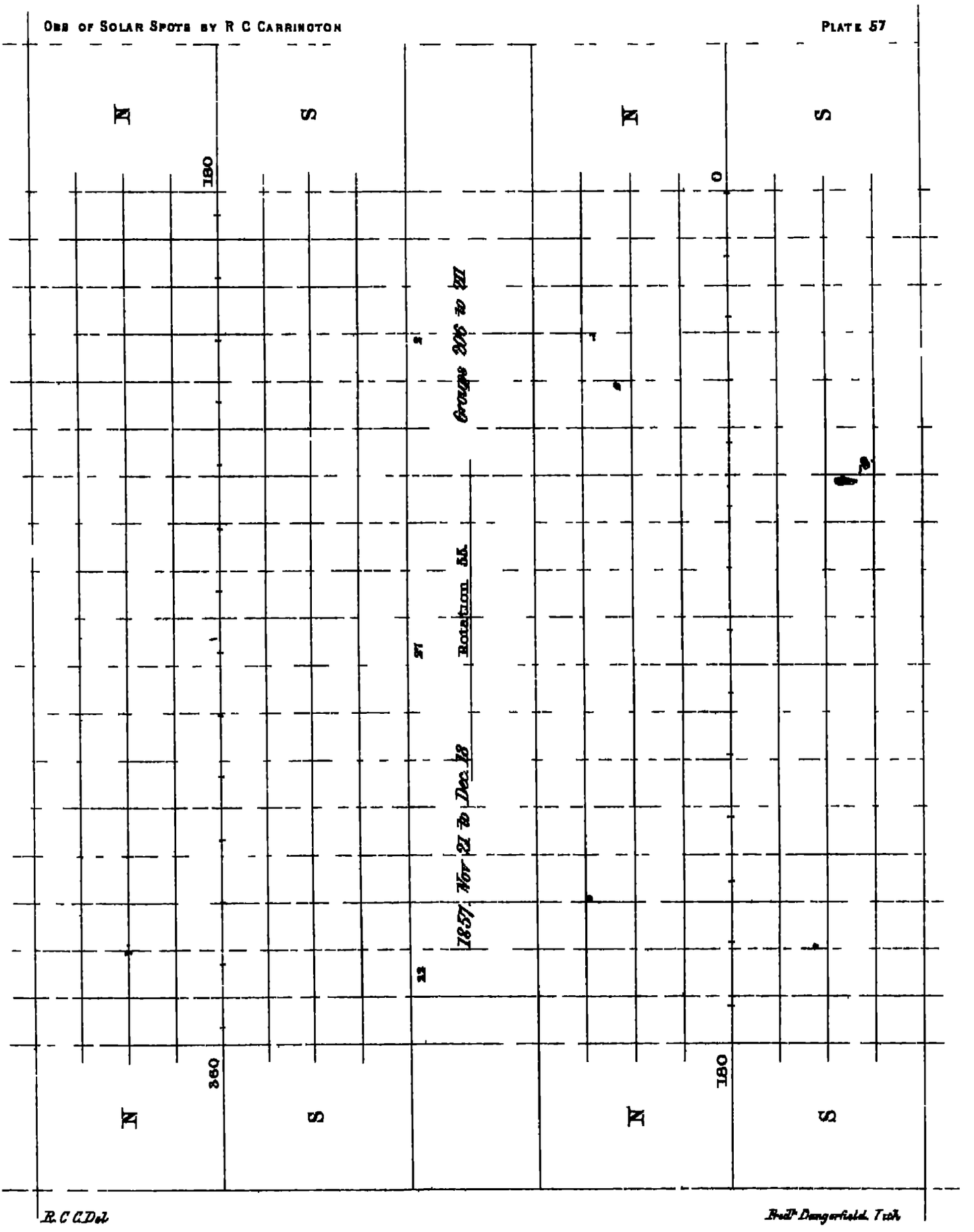
R C C Del

Fredk Dangerfield Lith



R. C. C. Del.

Fredk. Dangerfield, Lith.

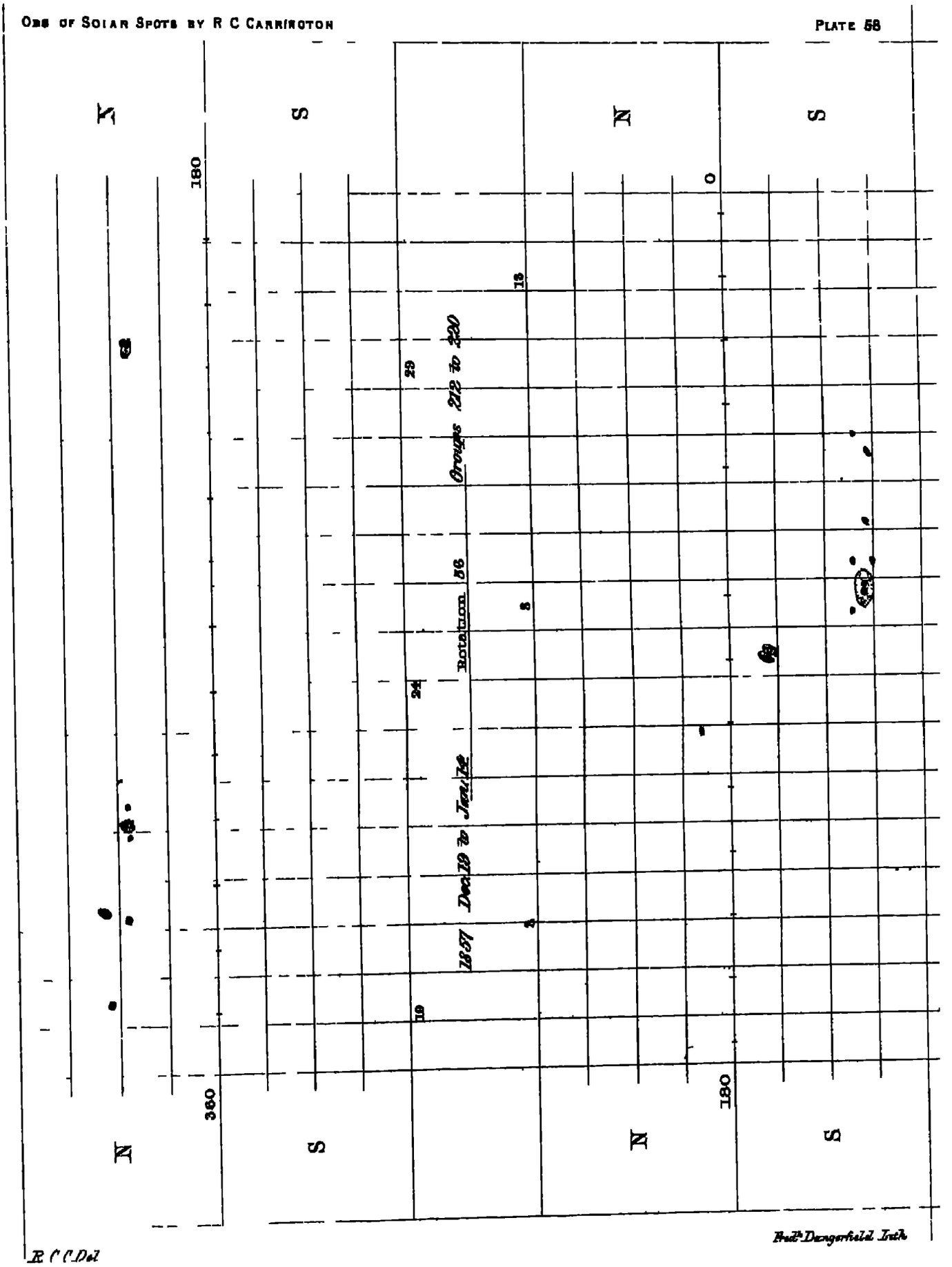


R. C. C. Del.

Fredk Dangerfield, Lith.

Obs of Solar Spots by R C Carrington

Plate 58


N
S
N
S
180
0
360
180
18
29
Oct. 28 to Nov. 25
Oct. 28 to Nov. 25
Nov. 25 to Dec. 23
Nov. 25 to Dec. 23
Dec. 23 to Jan. 20
Dec. 23 to Jan. 20
Jan. 20 to Feb. 17
Jan. 20 to Feb. 17
Feb. 17 to Mar. 17
Feb. 17 to Mar. 17
Mar. 17 to Apr. 13
Mar. 17 to Apr. 13
Apr. 13 to May 11
Apr. 13 to May 11
May 11 to June 8
May 11 to June 8
June 8 to July 5
June 8 to July 5
July 5 to Aug. 2
July 5 to Aug. 2
Aug. 2 to Aug. 29
Aug. 2 to Aug. 29
Aug. 29 to Sept. 26
Aug. 29 to Sept. 26
Sept. 26 to Oct. 24
Sept. 26 to Oct. 24
Oct. 24 to Nov. 21
Oct. 24 to Nov. 21
Nov. 21 to Dec. 19
Nov. 21 to Dec. 19
Dec. 19 to Jan. 16
Dec. 19 to Jan. 16
Jan. 16 to Feb. 13
Jan. 16 to Feb. 13
Feb. 13 to Mar. 13
Feb. 13 to Mar. 13
Mar. 13 to Apr. 10
Mar. 13 to Apr. 10
Apr. 10 to May 8
Apr. 10 to May 8
May 8 to June 5
May 8 to June 5
June 5 to July 3
June 5 to July 3
July 3 to July 31
July 3 to July 31
July 31 to Aug. 28
July 31 to Aug. 28
Aug. 28 to Sept. 25
Aug. 28 to Sept. 25
Sept. 25 to Oct. 23
Sept. 25 to Oct. 23
Oct. 23 to Nov. 20
Oct. 23 to Nov. 20
Nov. 20 to Dec. 18
Nov. 20 to Dec. 18
Dec. 18 to Jan. 15
Dec. 18 to Jan. 15
Jan. 15 to Feb. 12
Jan. 15 to Feb. 12
Feb. 12 to Mar. 12
Feb. 12 to Mar. 12
Mar. 12 to Apr. 9
Mar. 12 to Apr. 9
Apr. 9 to May 7
Apr. 9 to May 7
May 7 to June 4
May 7 to June 4
June 4 to July 2
June 4 to July 2
July 2 to July 30
July 2 to July 30
July 30 to Aug. 27
July 30 to Aug. 27
Aug. 27 to Sept. 24
Aug. 27 to Sept. 24
Sept. 24 to Oct. 22
Sept. 24 to Oct. 22
Oct. 22 to Nov. 19
Oct. 22 to Nov. 19
Nov. 19 to Dec. 17
Nov. 19 to Dec. 17
Dec. 17 to Jan. 14
Dec. 17 to Jan. 14
Jan. 14 to Feb. 11
Jan. 14 to Feb. 11
Feb. 11 to Mar. 11
Feb. 11 to Mar. 11
Mar. 11 to Apr. 8
Mar. 11 to Apr. 8
Apr. 8 to May 6
Apr. 8 to May 6
May 6 to June 3
May 6 to June 3
June 3 to July 1
June 3 to July 1
July 1 to July 29
July 1 to July 29
July 29 to Aug. 26
July 29 to Aug. 26
Aug. 26 to Sept. 23
Aug. 26 to Sept. 23
Sept. 23 to Oct. 21
Sept. 23 to Oct. 21
Oct. 21 to Nov. 18
Oct. 21 to Nov. 18
Nov. 18 to Dec. 16
Nov. 18 to Dec. 16
Dec. 16 to Jan. 13
Dec. 16 to Jan. 13
Jan. 13 to Feb. 10
Jan. 13 to Feb. 10
Feb. 10 to Mar. 10
Feb. 10 to Mar. 10
Mar. 10 to Apr. 7
Mar. 10 to Apr. 7
Apr. 7 to May 5
Apr. 7 to May 5
May 5 to June 2
May 5 to June 2
June 2 to June 30
June 2 to June 30
June 30 to July 28
June 30 to July 28
July 28 to Aug. 25
July 28 to Aug. 25
Aug. 25 to Sept. 22
Aug. 25 to Sept. 22
Sept. 22 to Oct. 20
Sept. 22 to Oct. 20
Oct. 20 to Nov. 17
Oct. 20 to Nov. 17
Nov. 17 to Dec. 15
Nov. 17 to Dec. 15
Dec. 15 to Jan. 12
Dec. 15 to Jan. 12
Jan. 12 to Feb. 9
Jan. 12 to Feb. 9
Feb. 9 to Mar. 9
Feb. 9 to Mar. 9
Mar. 9 to Apr. 6
Mar. 9 to Apr. 6
Apr. 6 to May 4
Apr. 6 to May 4
May 4 to June 1
May 4 to June 1
June 1 to June 29
June 1 to June 29
June 29 to July 27
June 29 to July 27
July 27 to Aug. 24
July 27 to Aug. 24
Aug. 24 to Sept. 21
Aug. 24 to Sept. 21
Sept. 21 to Oct. 19
Sept. 21 to Oct. 19
Oct. 19 to Nov. 16
Oct. 19 to Nov. 16
Nov. 16 to Dec. 14
Nov. 16 to Dec. 14
Dec. 14 to Jan. 11
Dec. 14 to Jan. 11
Jan. 11 to Feb. 8
Jan. 11 to Feb. 8
Feb. 8 to Mar. 8
Feb. 8 to Mar. 8
Mar. 8 to Apr. 5
Mar. 8 to Apr. 5
Apr. 5 to May 3
Apr. 5 to May 3
May 3 to May 31
May 3 to May 31
May 31 to June 28
May 31 to June 28
June 28 to July 26
June 28 to July 26
July 26 to Aug. 23
July 26 to Aug. 23
Aug. 23 to Sept. 20
Aug. 23 to Sept. 20
Sept. 20 to Oct. 18
Sept. 20 to Oct. 18
Oct. 18 to Nov. 15
Oct. 18 to Nov. 15
Nov. 15 to Dec. 13
Nov. 15 to Dec. 13
Dec. 13 to Jan. 10
Dec. 13 to Jan. 10
Jan. 10 to Feb. 7
Jan. 10 to Feb. 7
Feb. 7 to Mar. 7
Feb. 7 to Mar. 7
Mar. 7 to Apr. 4
Mar. 7 to Apr. 4
Apr. 4 to May 2
Apr. 4 to May 2
May 2 to May 30
May 2 to May 30
May 30 to June 27
May 30 to June 27
June 27 to July 25
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Apr. 20 to May 18
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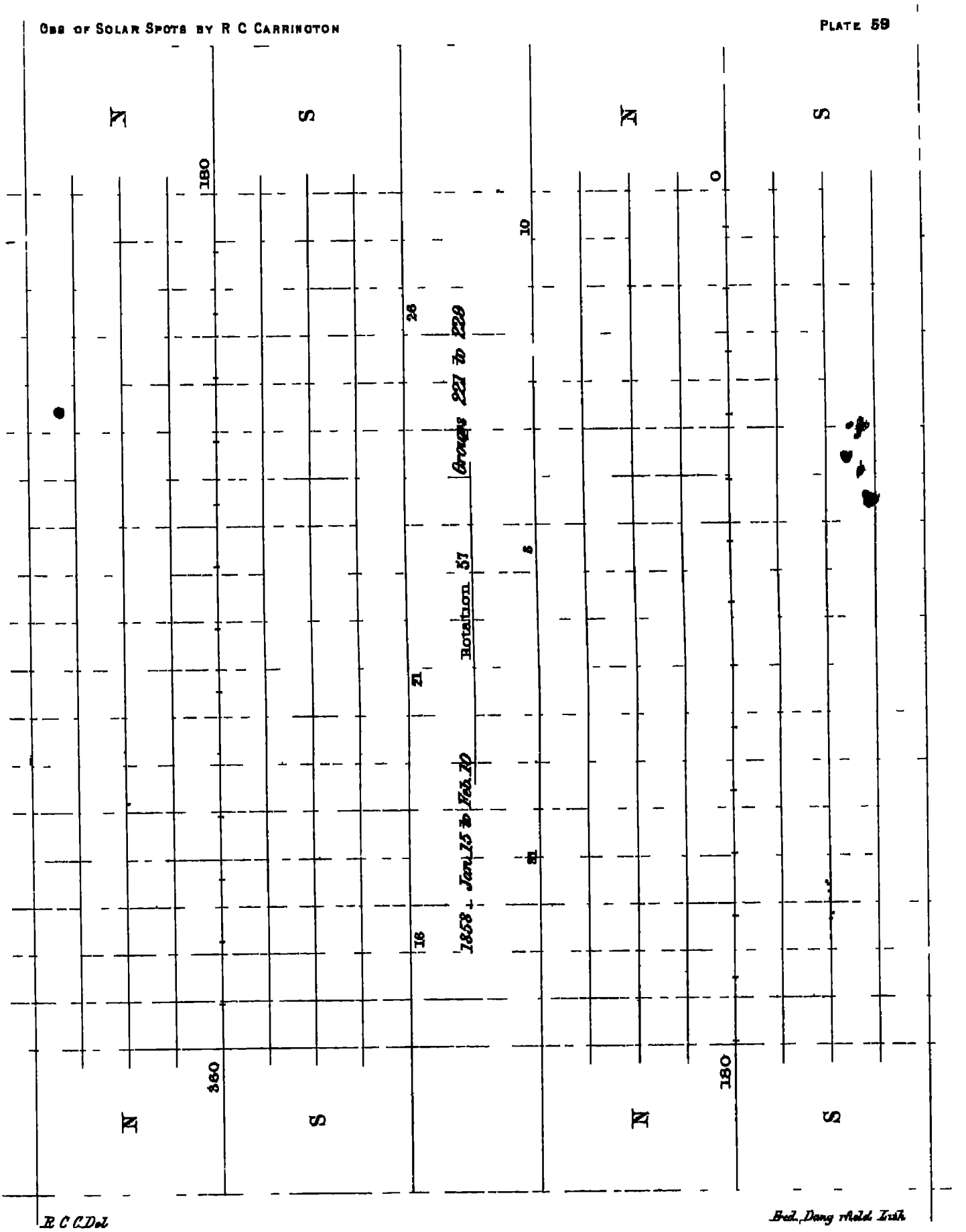
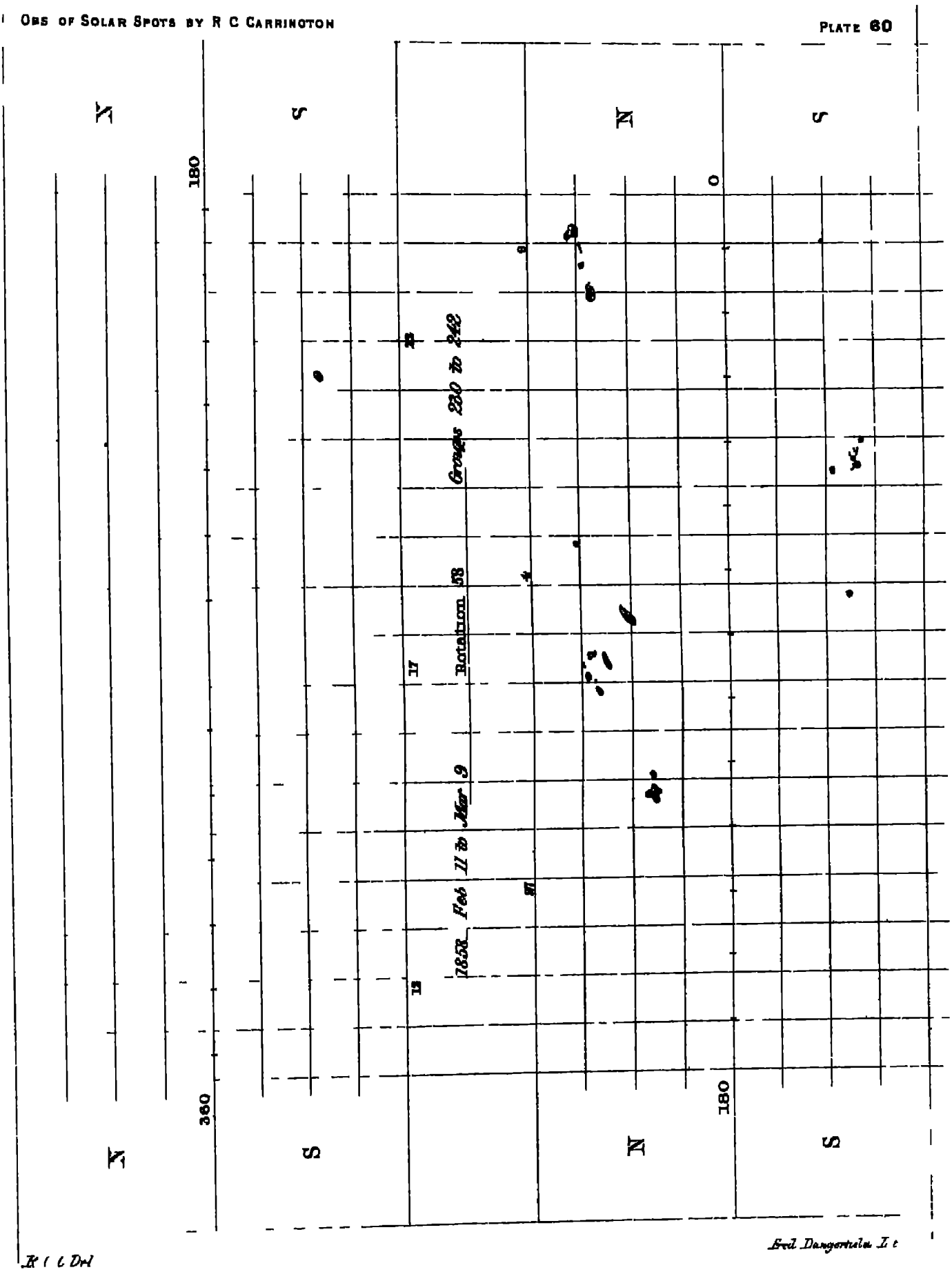
May 18 to June 15
May 18 to June 15
June 15 to July 13
June 15 to July 13
July 13 to Aug. 10
July 13 to Aug. 10
Aug. 10 to Sept. 7
Aug. 10 to Sept. 7
Sept. 7 to Oct. 5
Sept. 7 to Oct. 5
Oct. 5 to Nov. 2
Oct. 5 to Nov. 2
Nov. 2 to Nov. 30
Nov. 2 to Nov. 30
Nov. 30 to Dec. 28
Nov. 30 to Dec. 28
Dec. 28 to Jan. 25
Dec. 28 to Jan. 25
Jan. 25 to Feb.

Obs of Solar Spots by R C Carrington

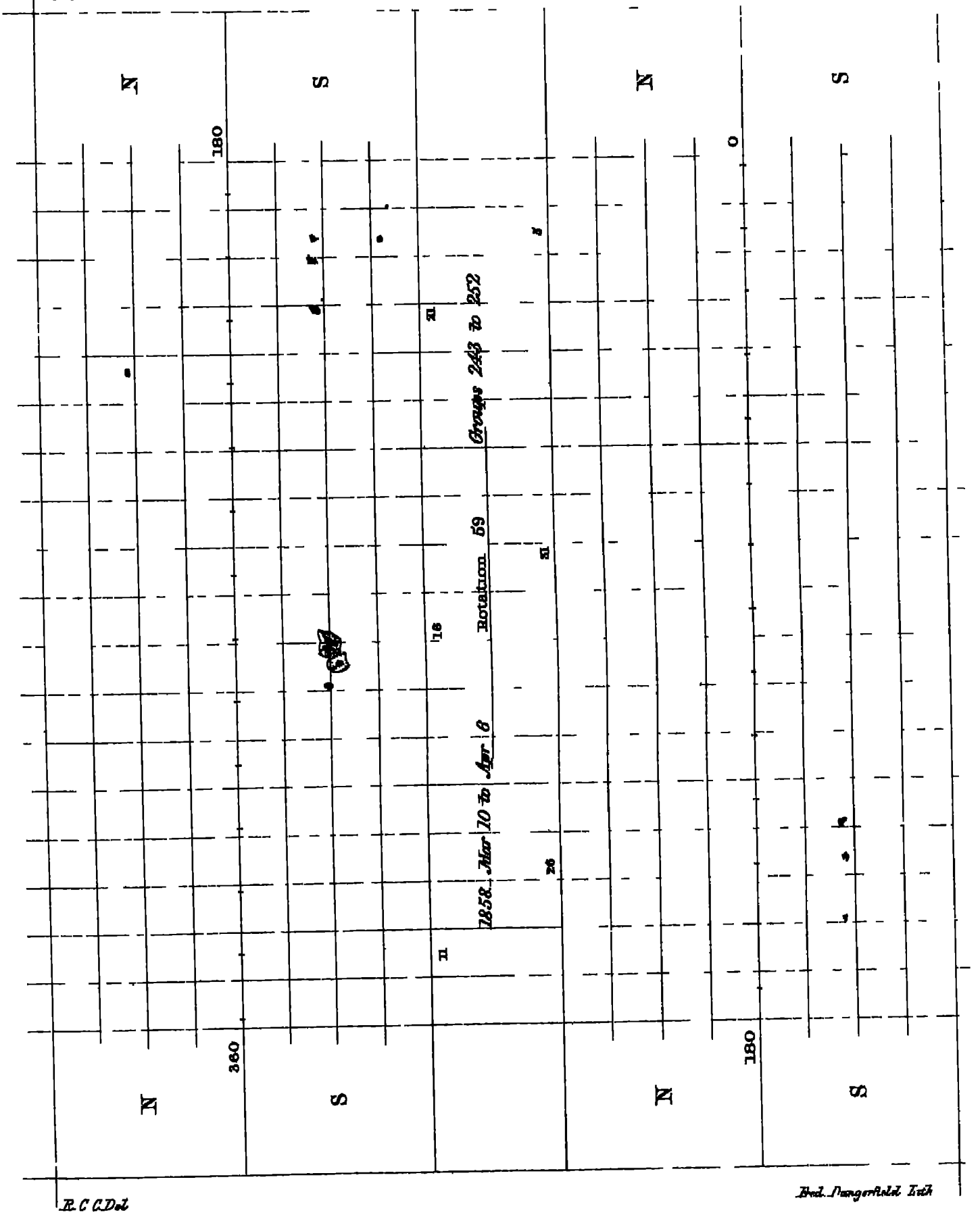
Plate 59





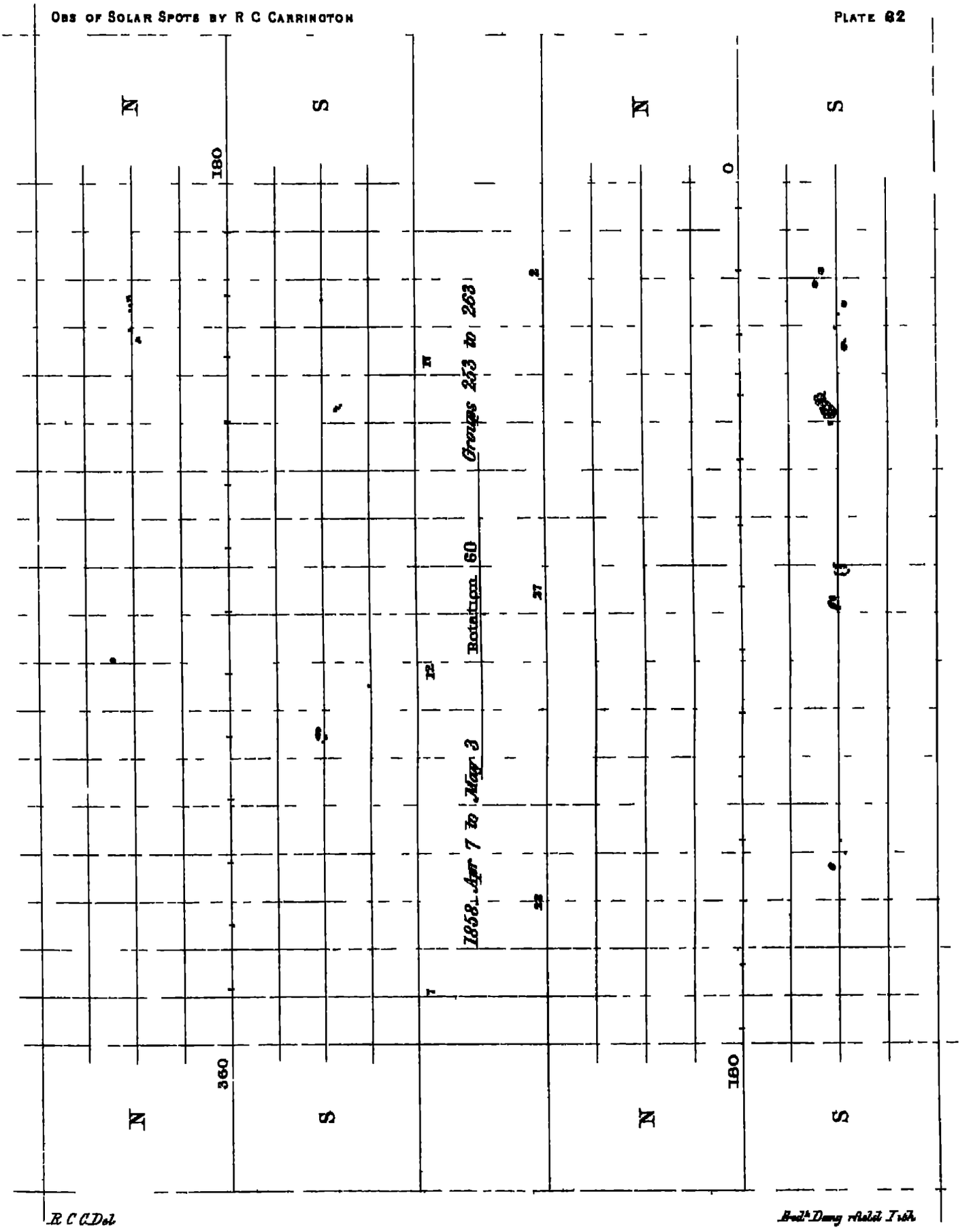
R C C Del

Fred Dangerfield Lt



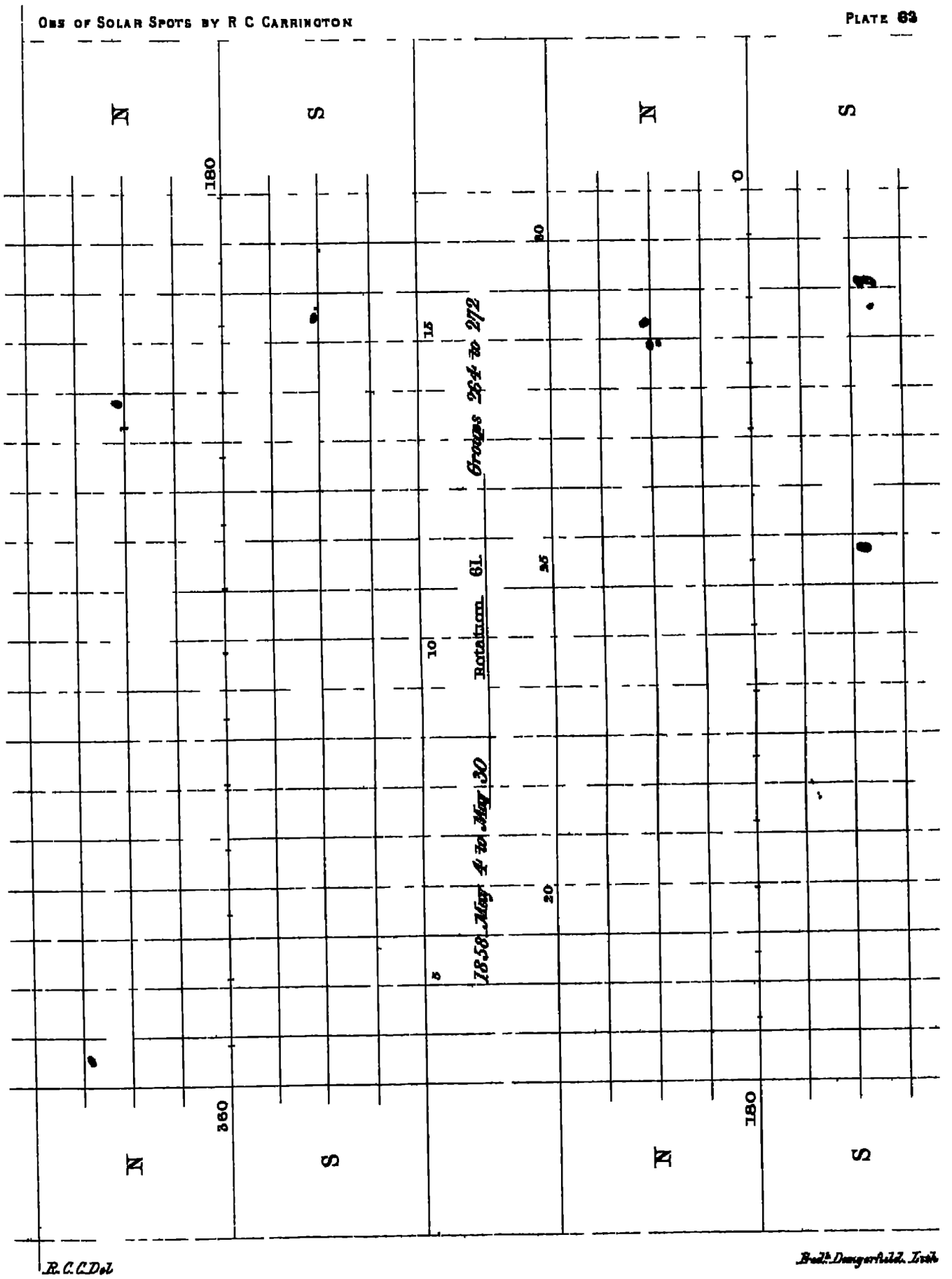
R. C. C. Del.

Fred. Dangerfield Lith



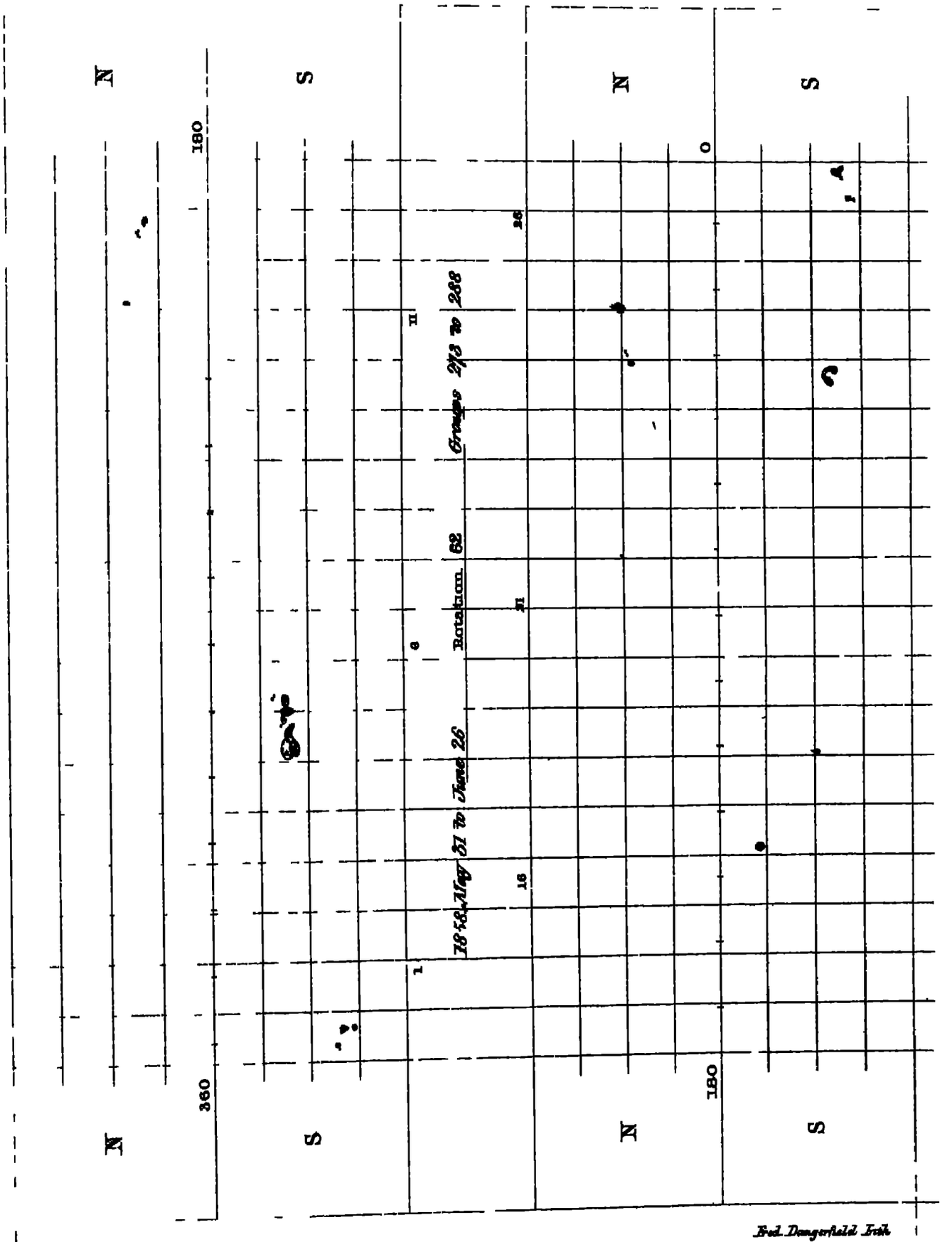
R C C Del

Fredk Dang rfield Lith



R. C. C. Del.

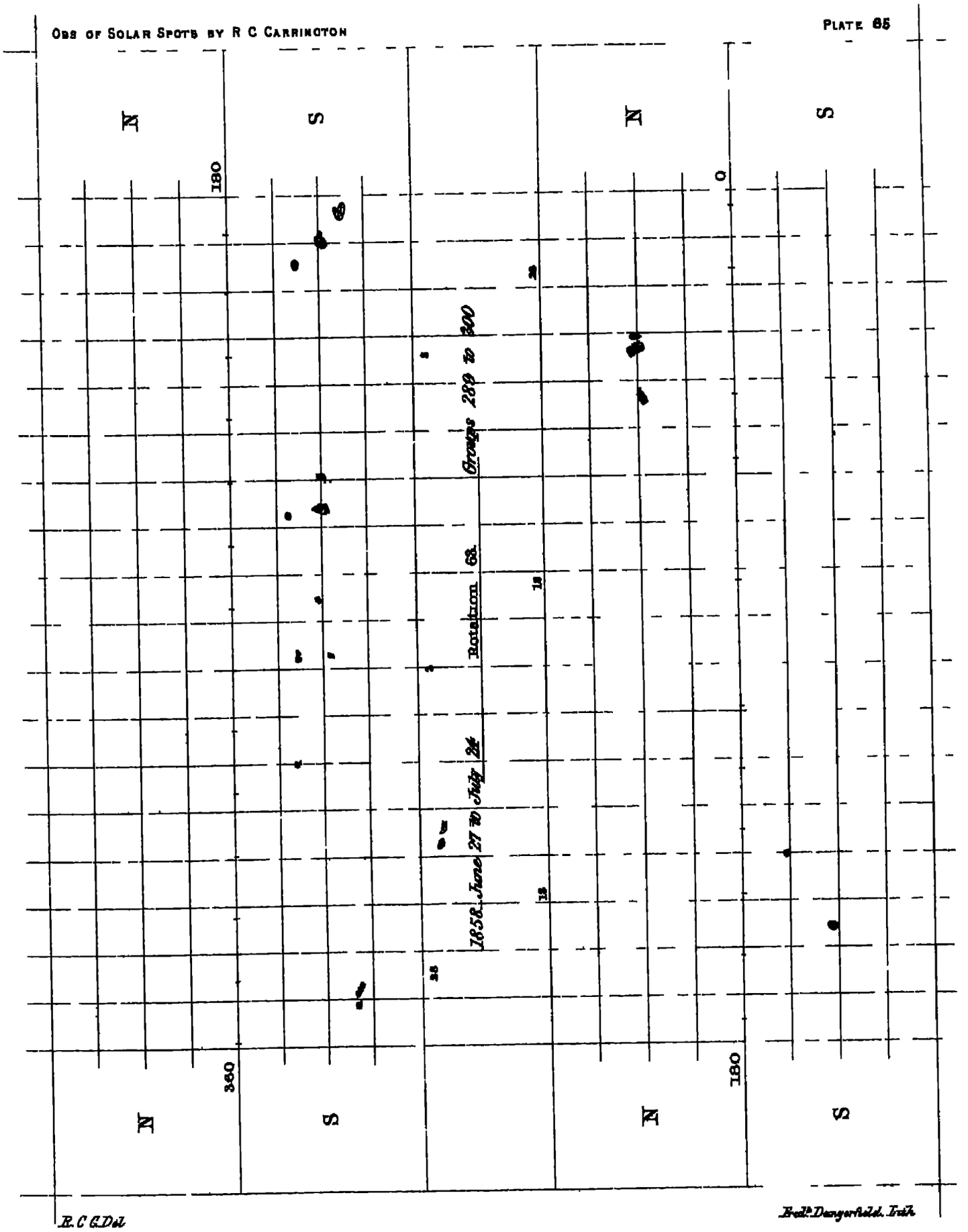
Fredk. Dangerfield. Lith.

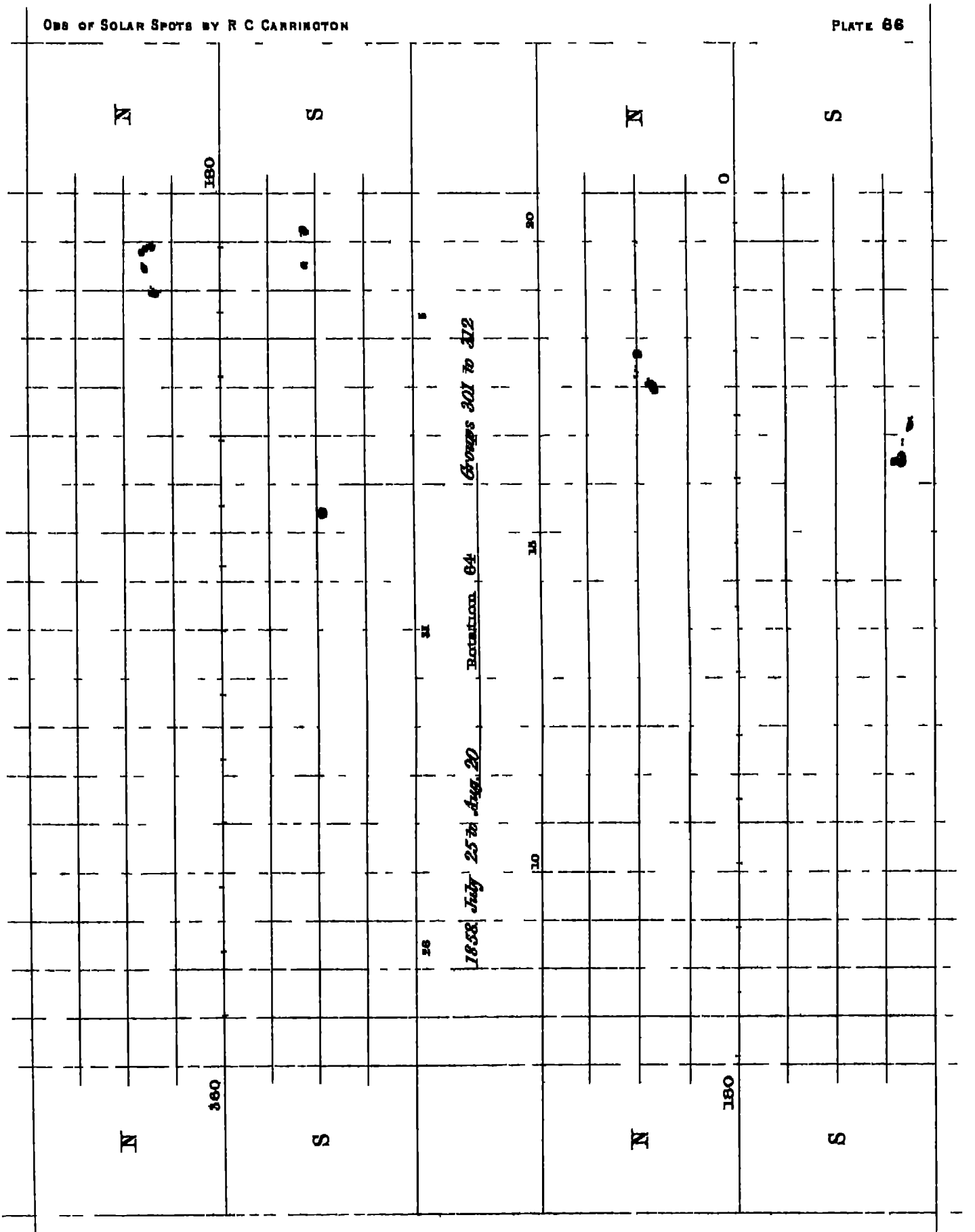


R C C Del

Fred. Dangerfield Lith

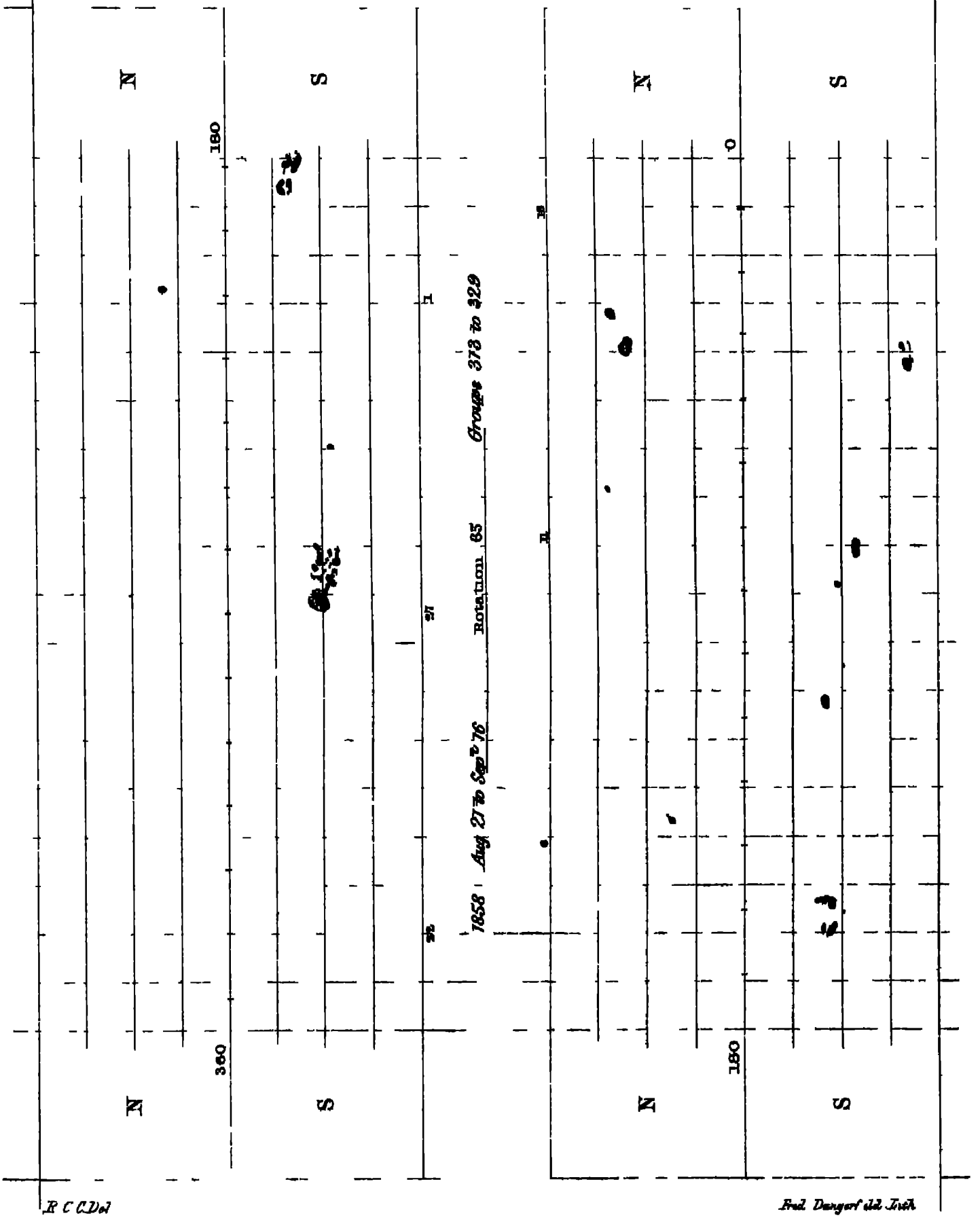
Obs of Solar Spots by R C Carrington





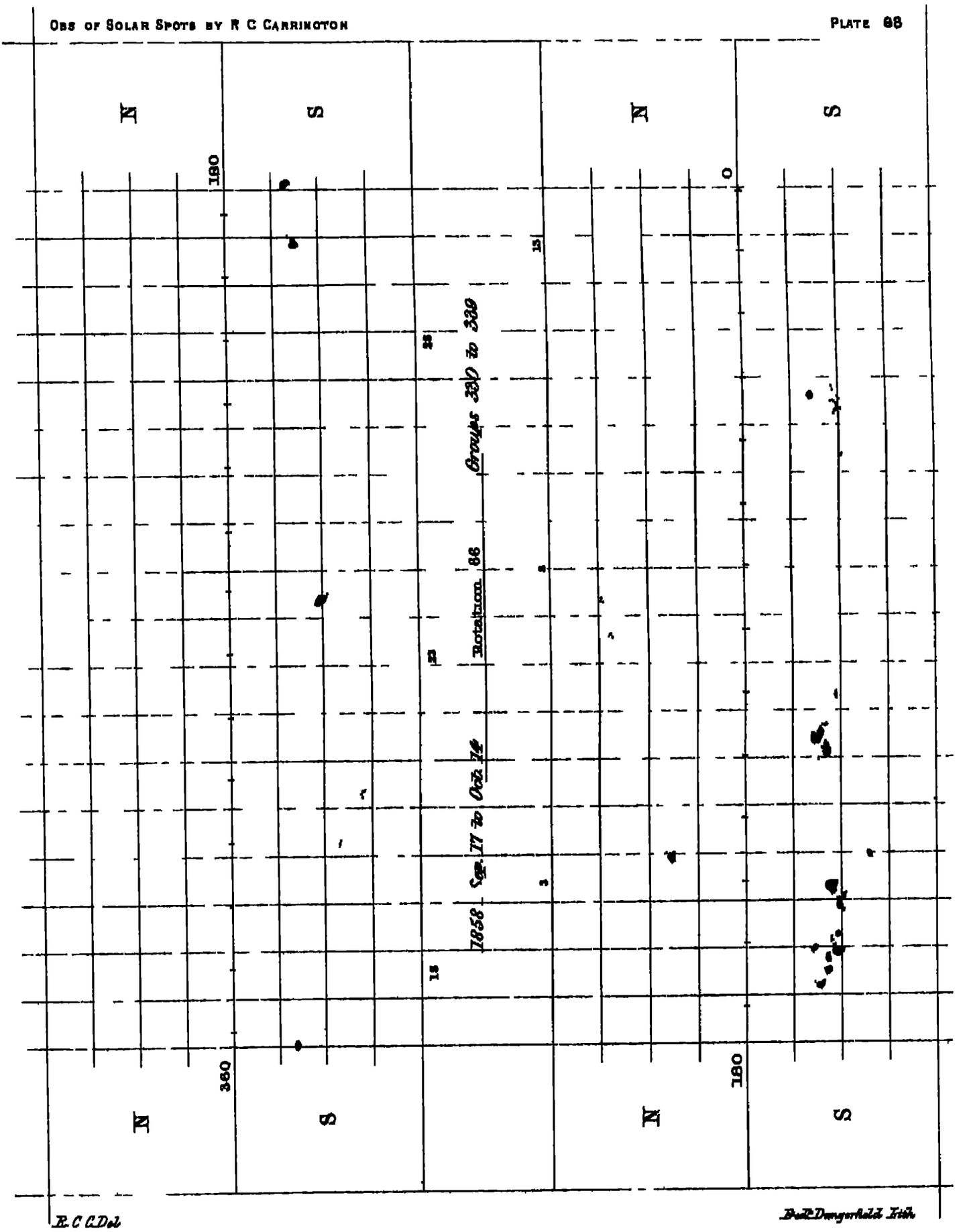
R. C. C. Del.

Fred. Dangerfield Lith.



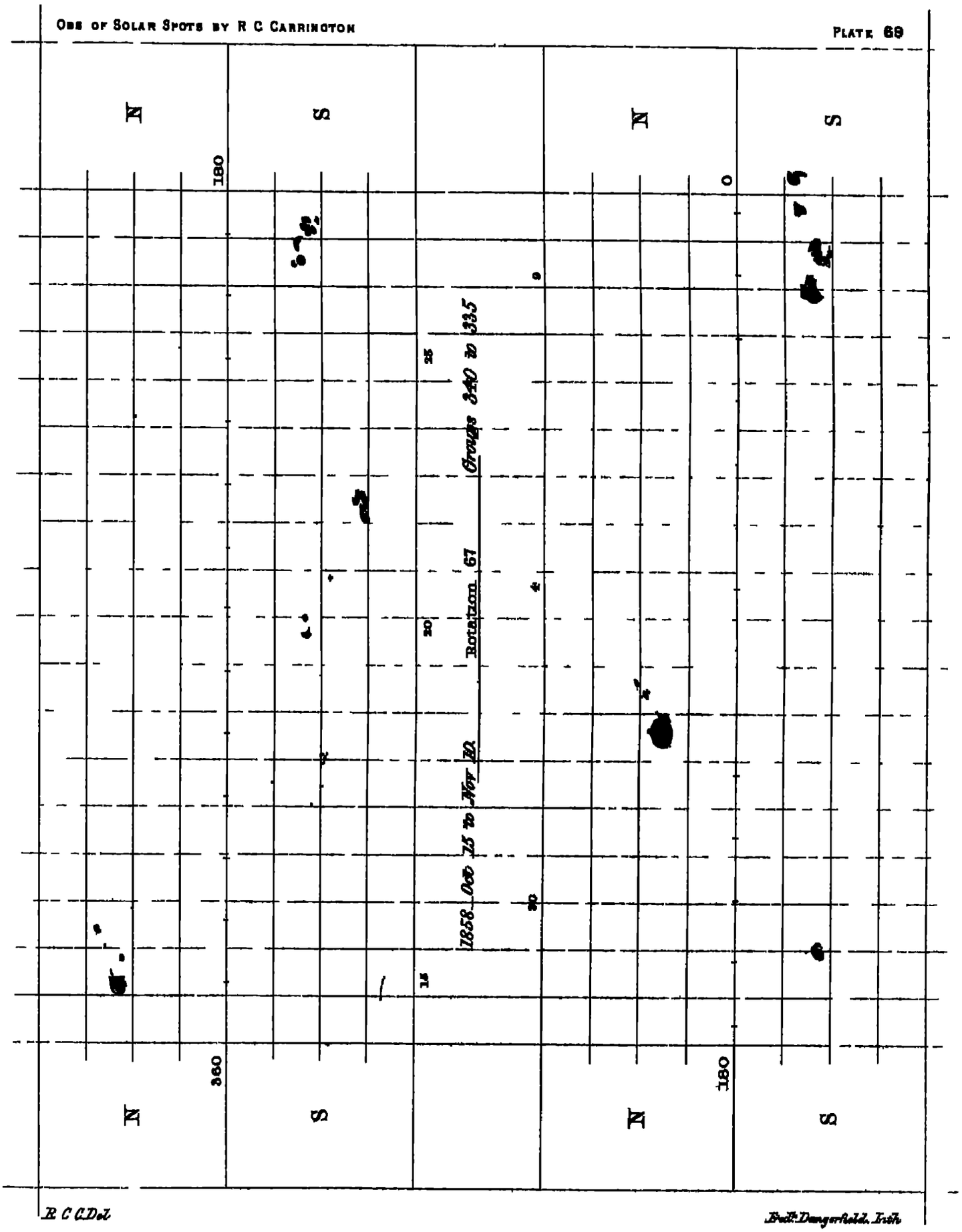
R C C Del

Fred Dangerfield Lith



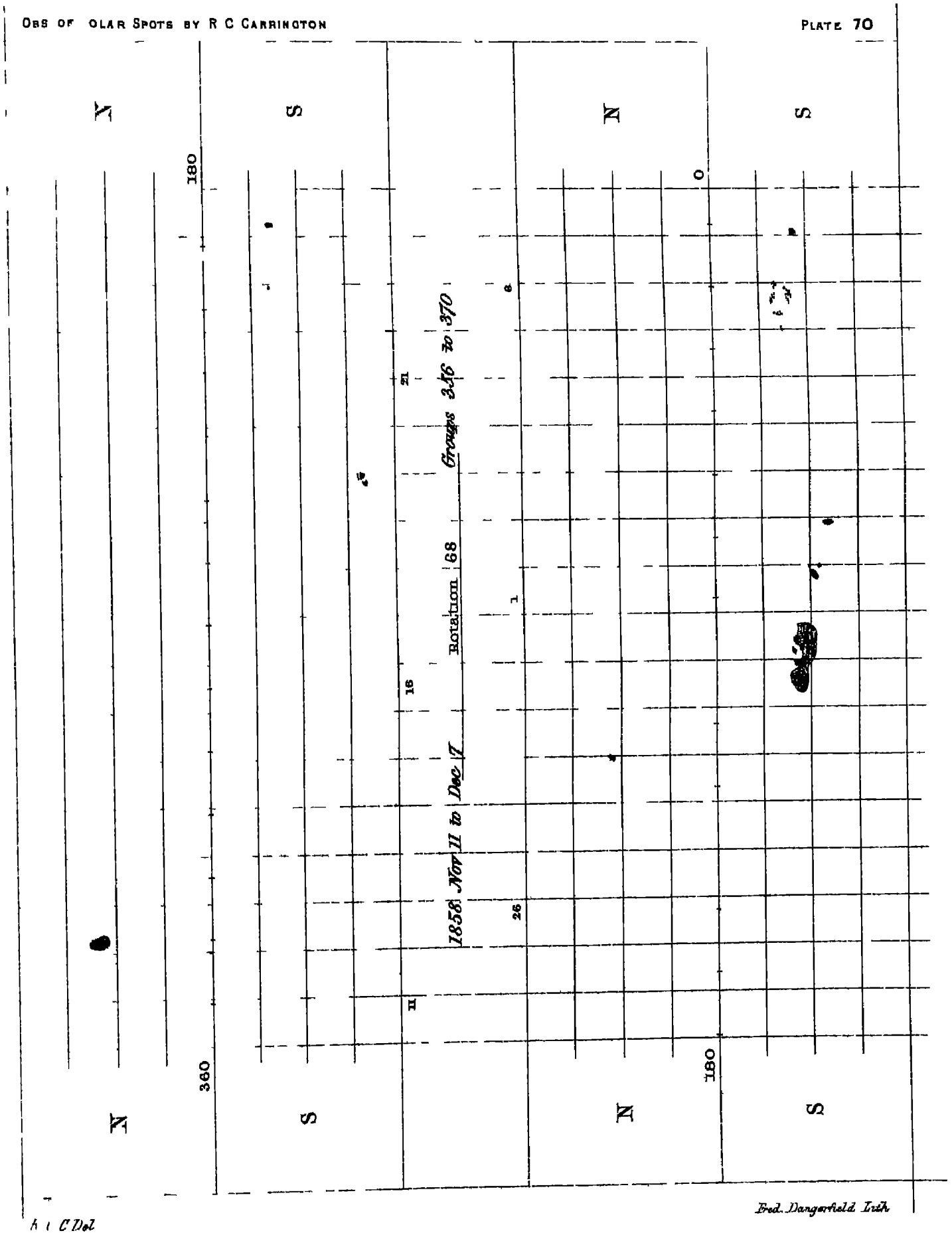
R. C. C. Del.

Fredk. Dangerfield Lith.

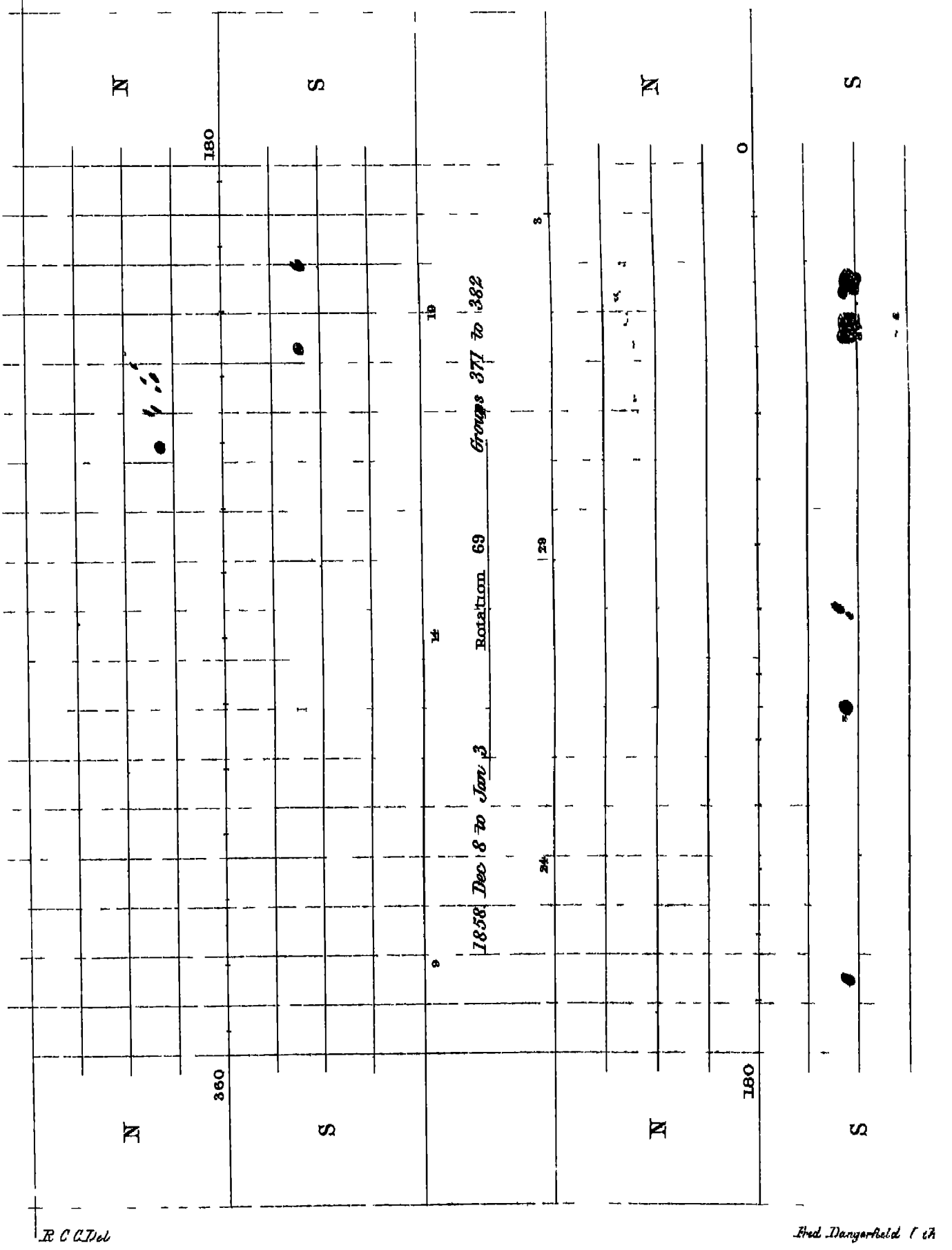


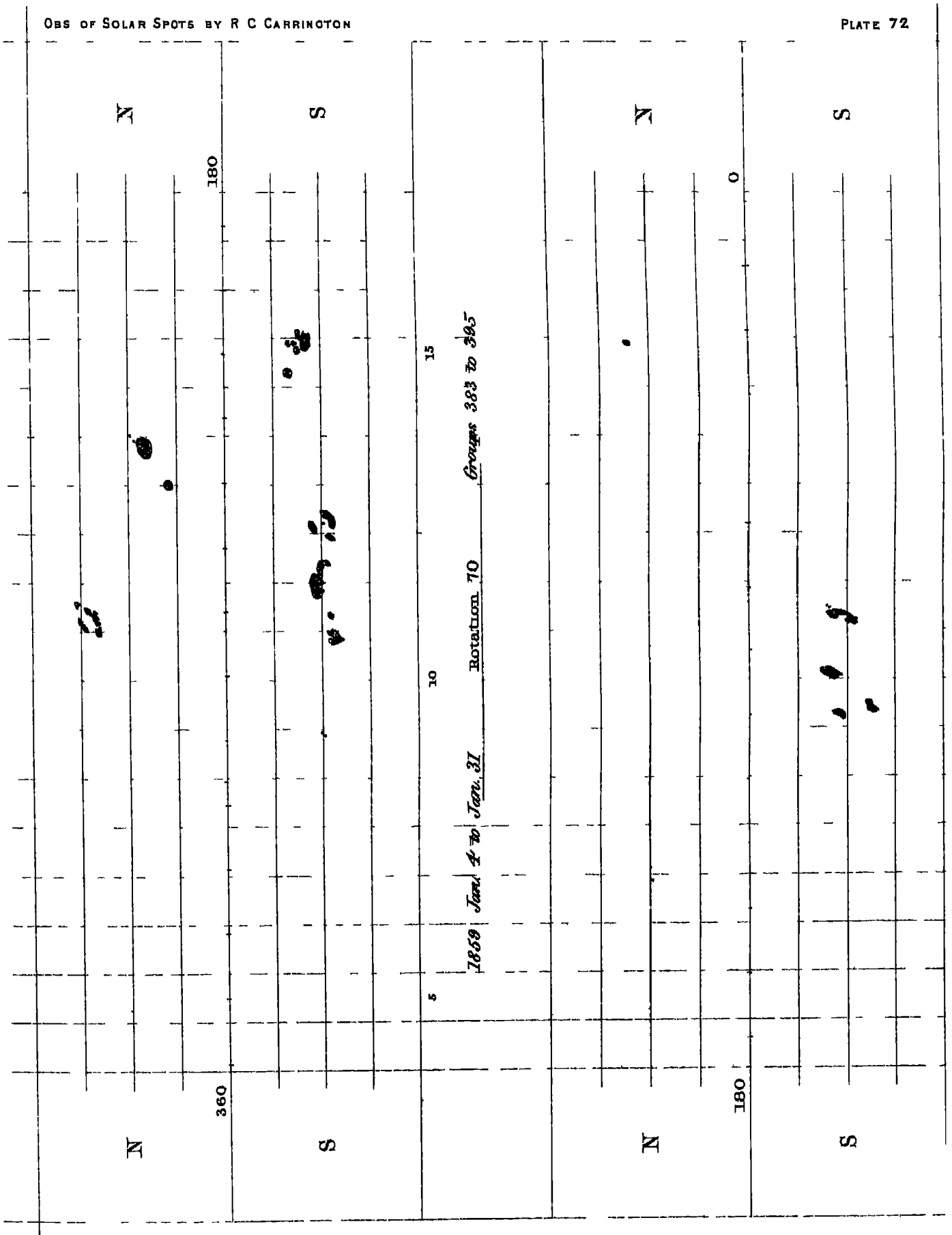
R C C Del

Fredk Dangerfield, Lith


N
S
N
S
180
0
360
180
Groups 346 to 370
Rotation 68
1858 Nov 11 to Dec 7
21
16
11
6
1
26
Fred. Dangerfield Lith.

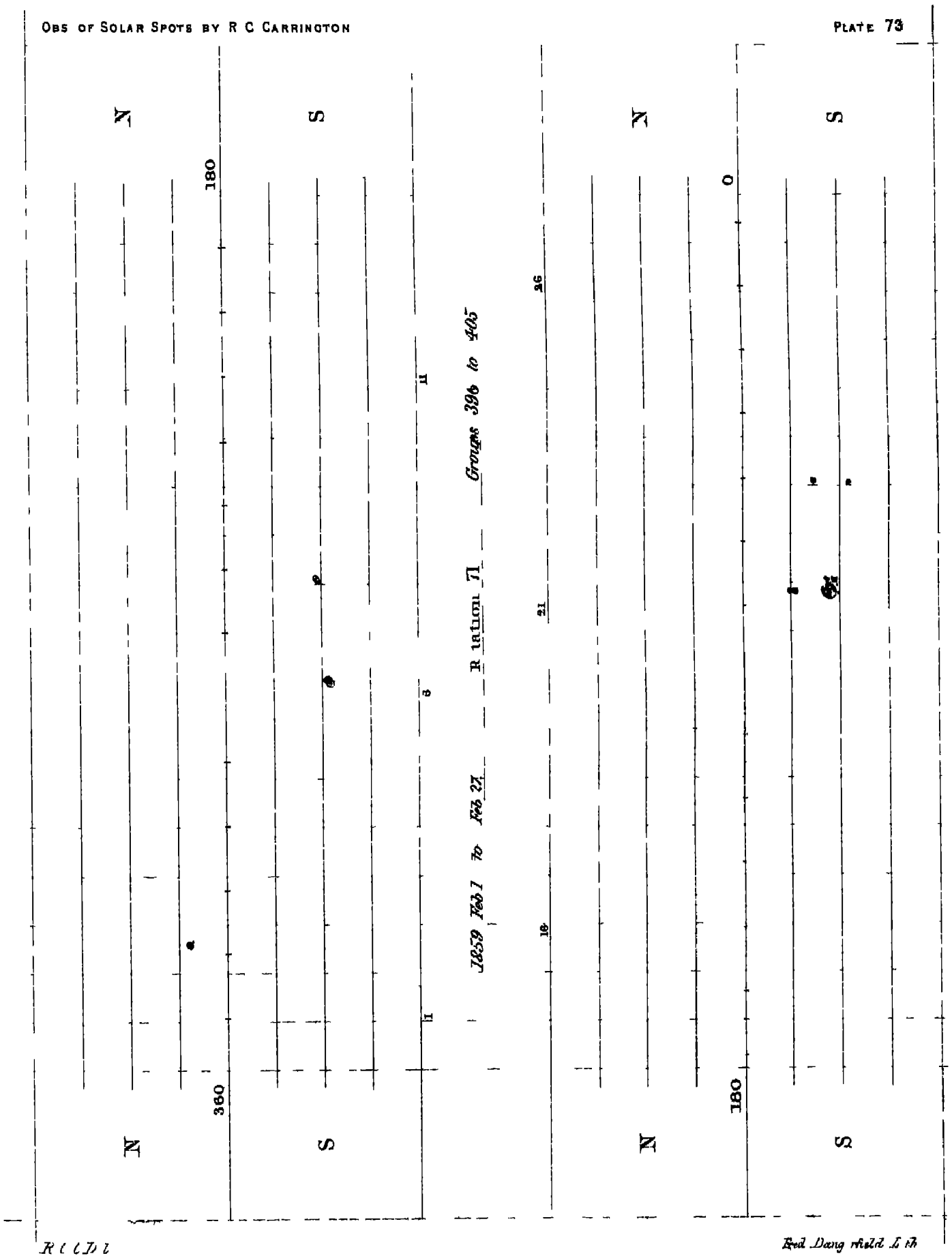
R C Del


N
S
180
0
360
Groups 377 to 382
Rotation 69
1858 Dec 8 to Jan 3
R C C Del
Fred Dangerfield Lith



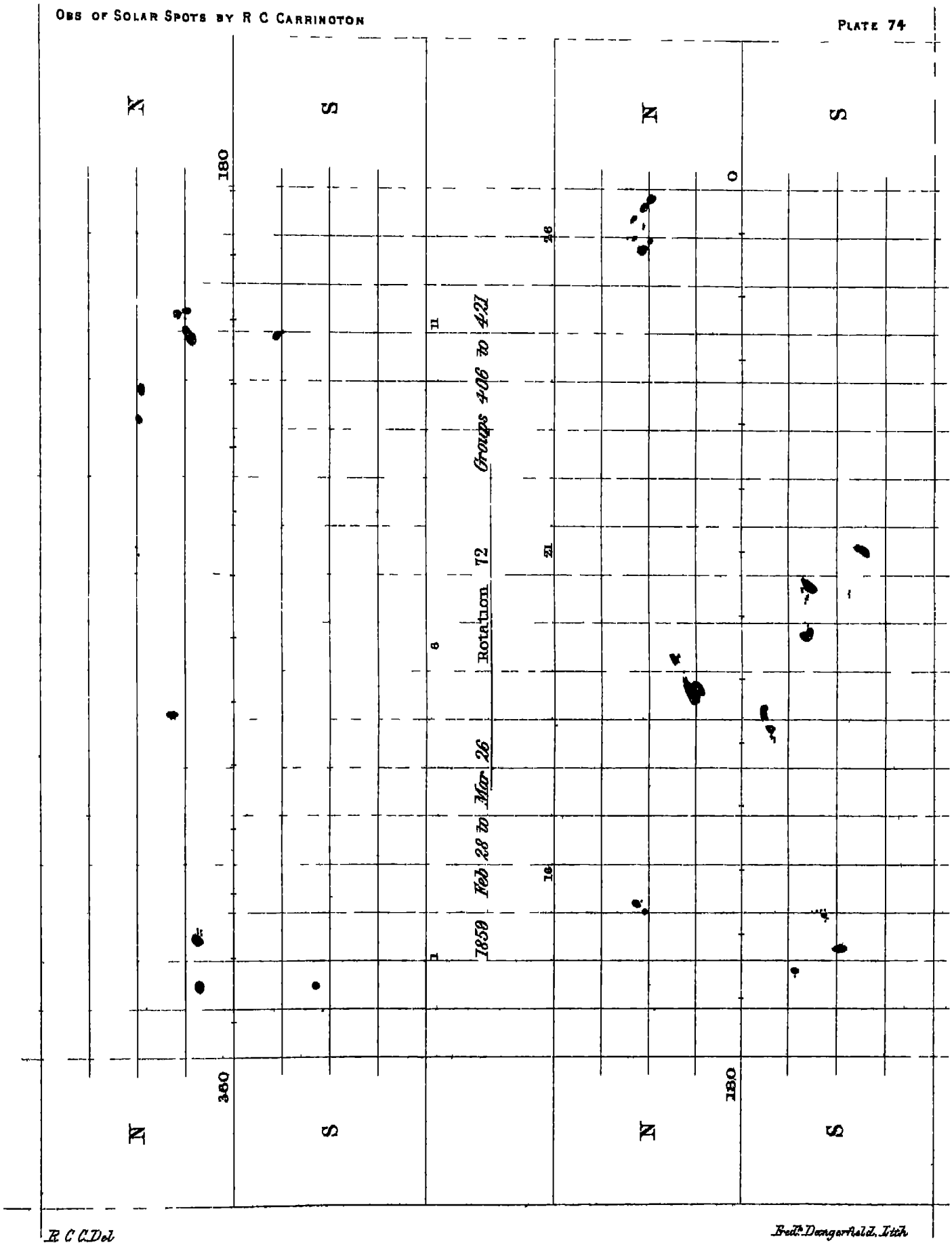
RCCD2

Fred. Dangerfield Lith.



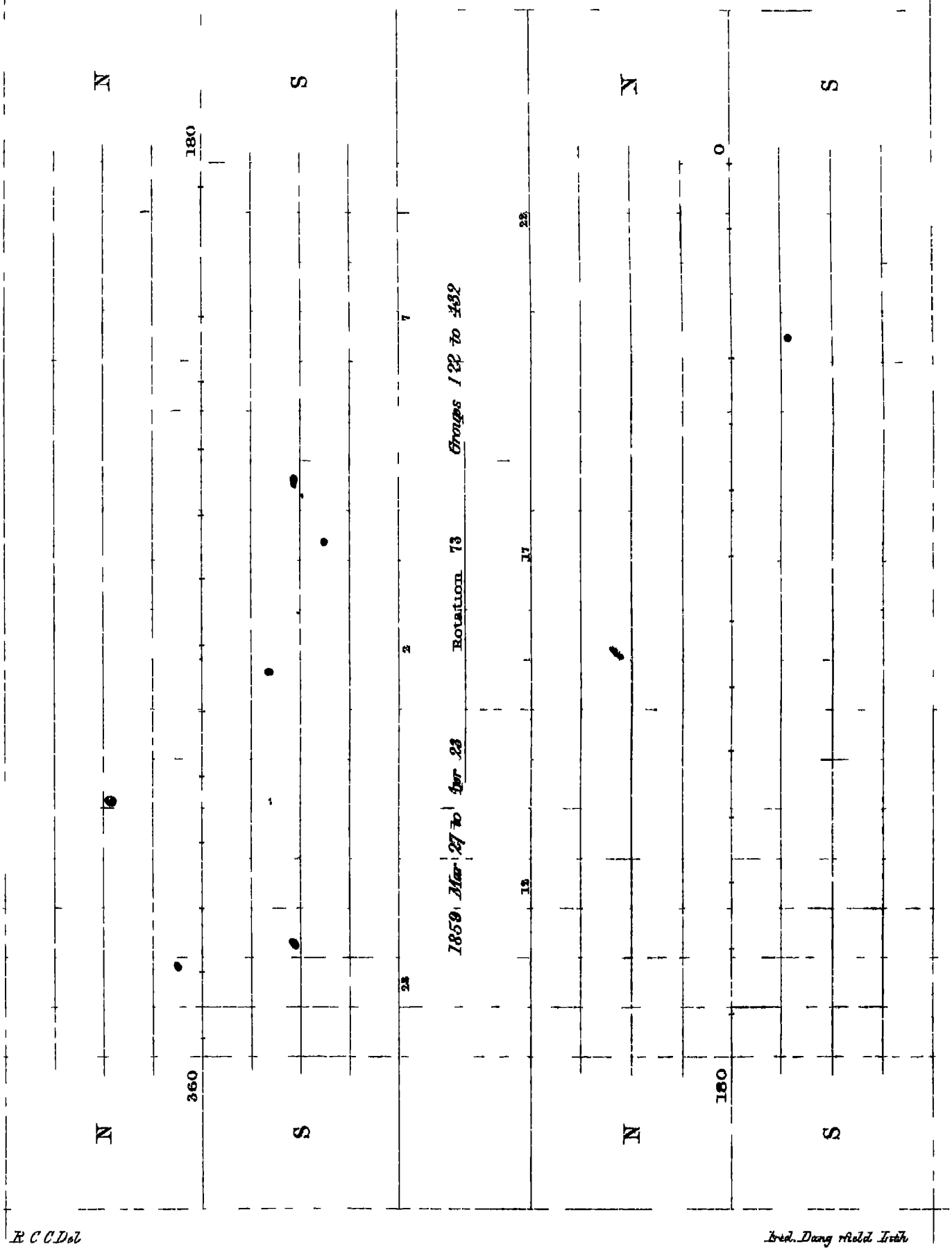
R C C D L

Fred Dangerfield Lith



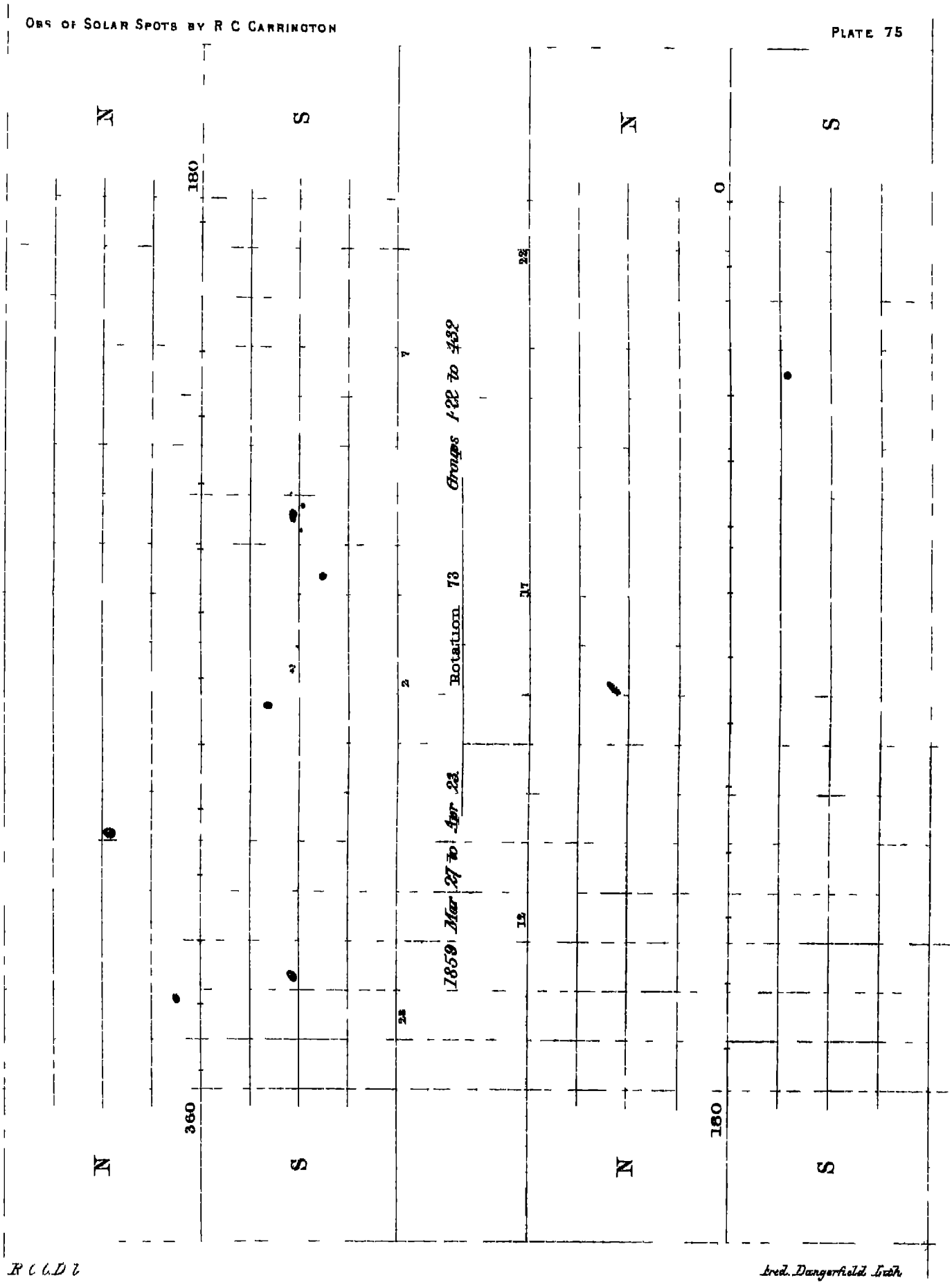
R C C Del

Fredk Dangerfield, Lith



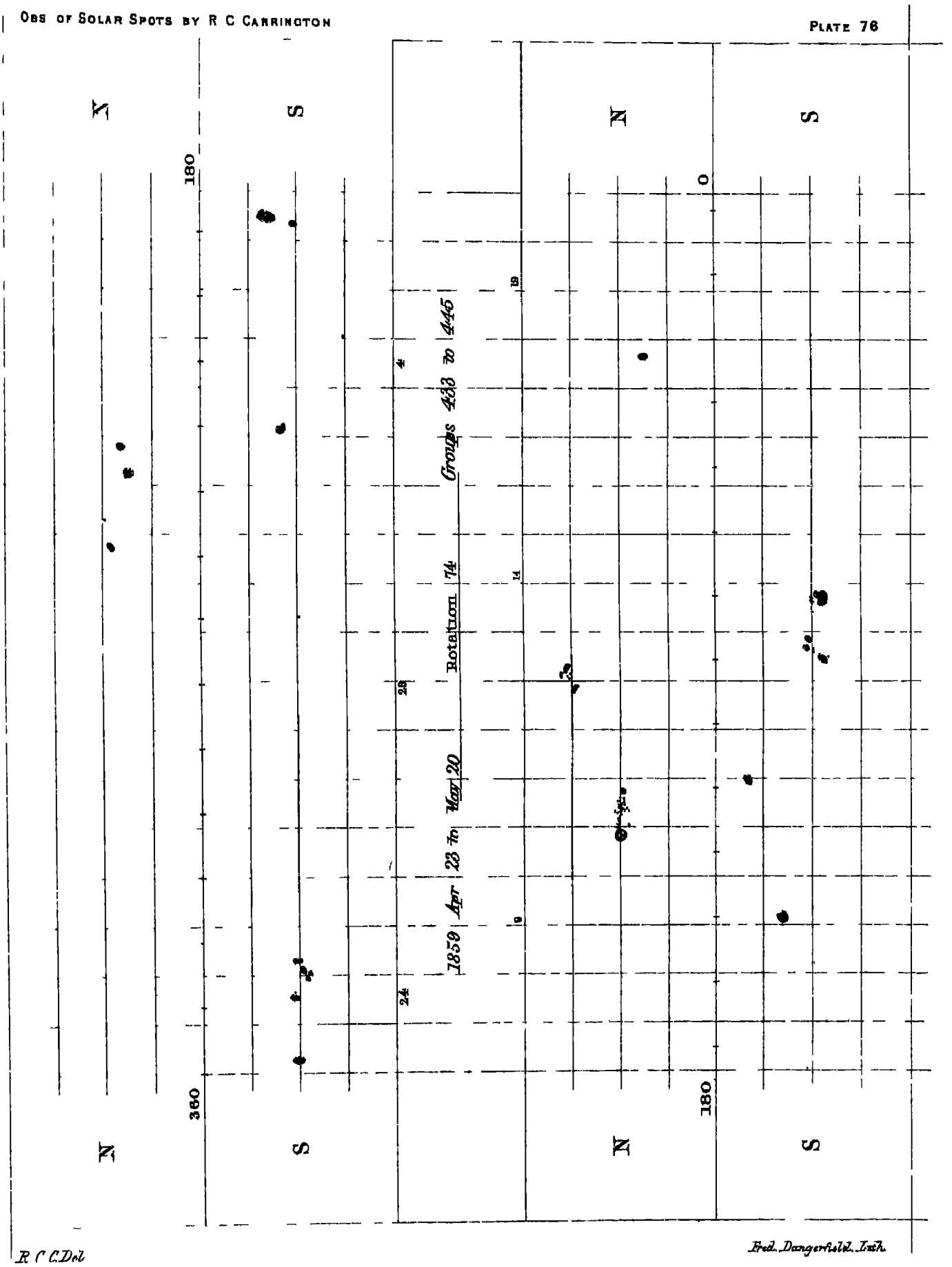
R C C Del

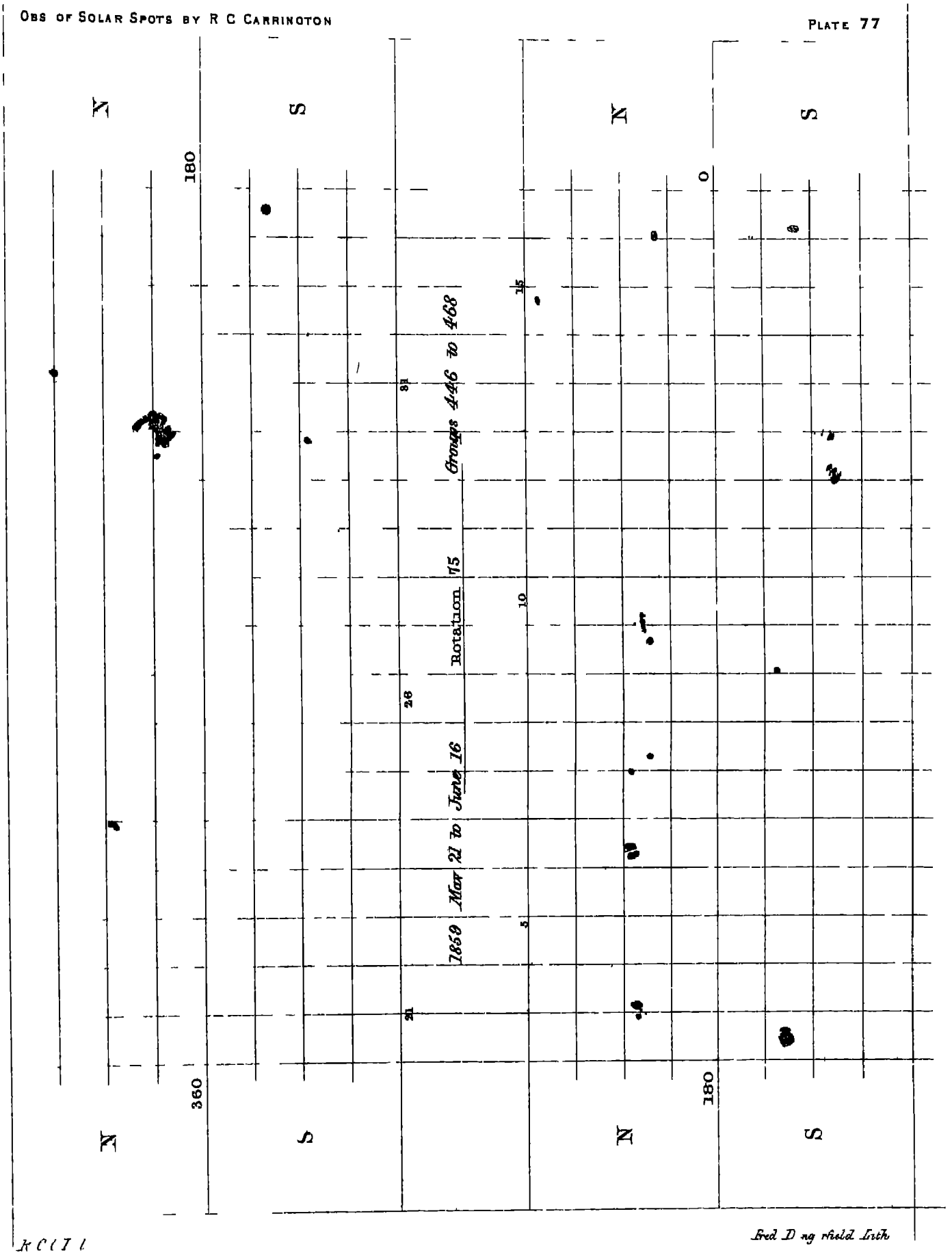
Fred. Dangerfield Lith



R C C D l

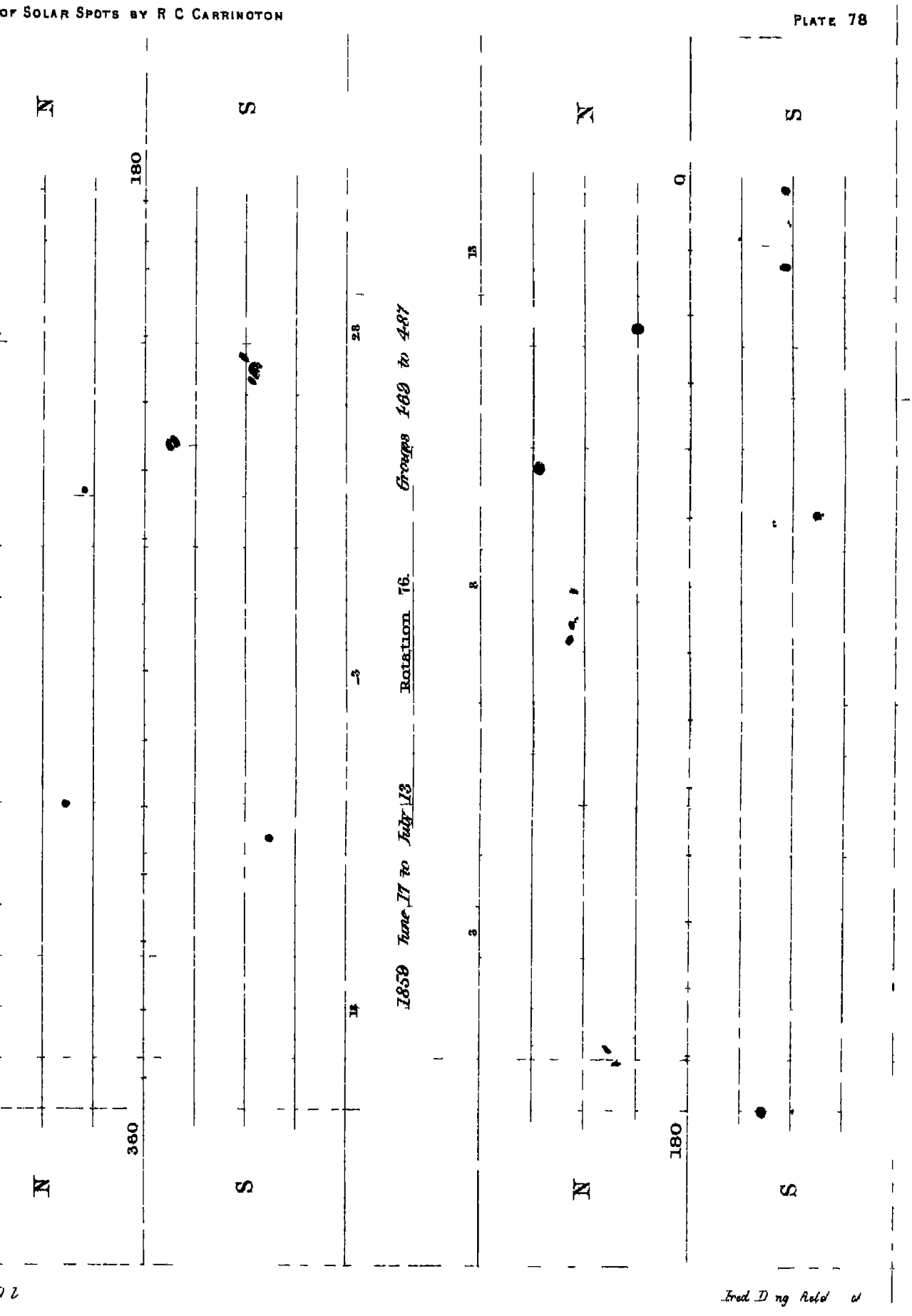
Fred. Dangerfield Lith

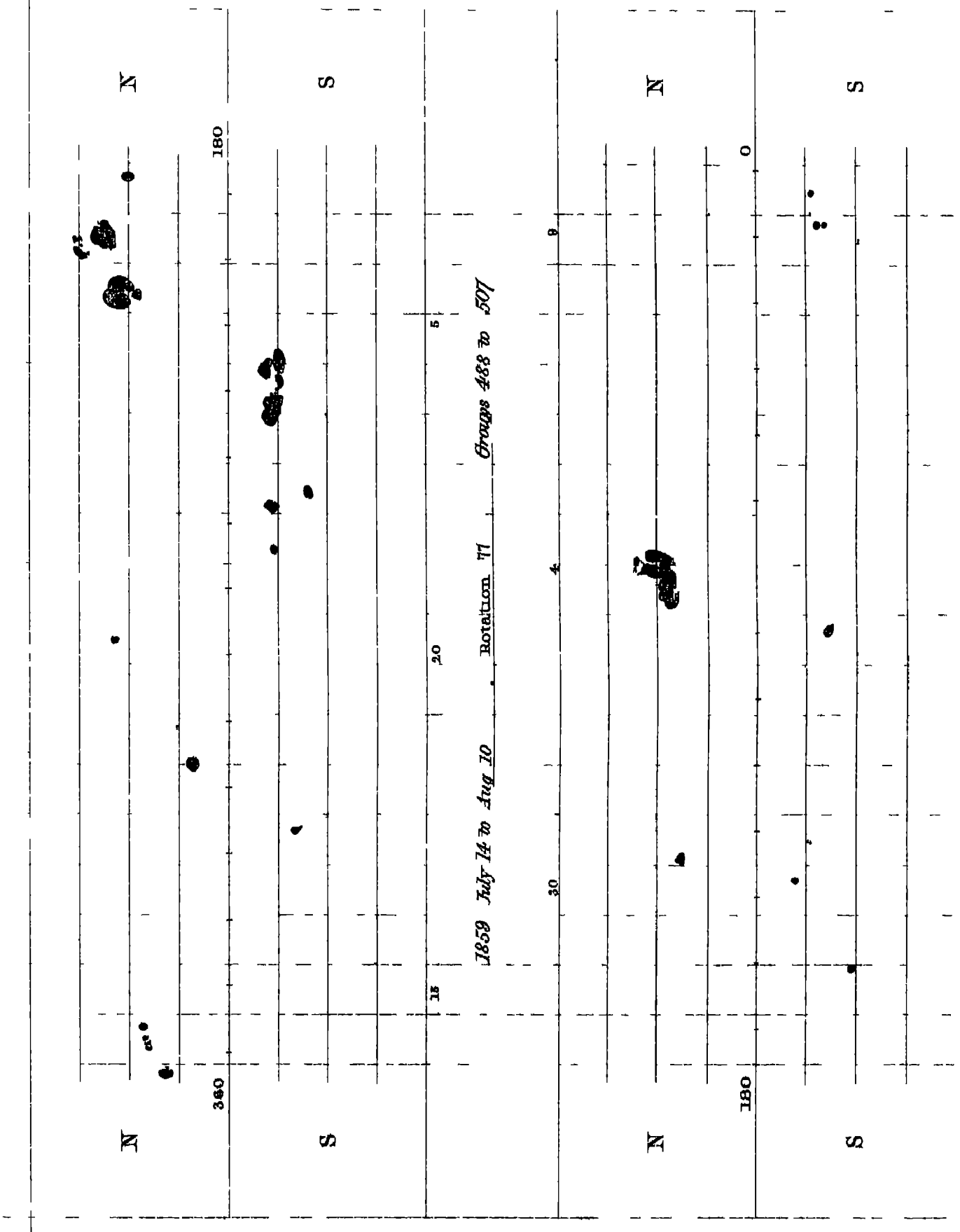

N
S
180
0
360
Groups 433 to 445
Rotation 74
1859 Apr 23 to May 20
R C C.Del
Fred. Dangerfield. Lith.



R C C I I

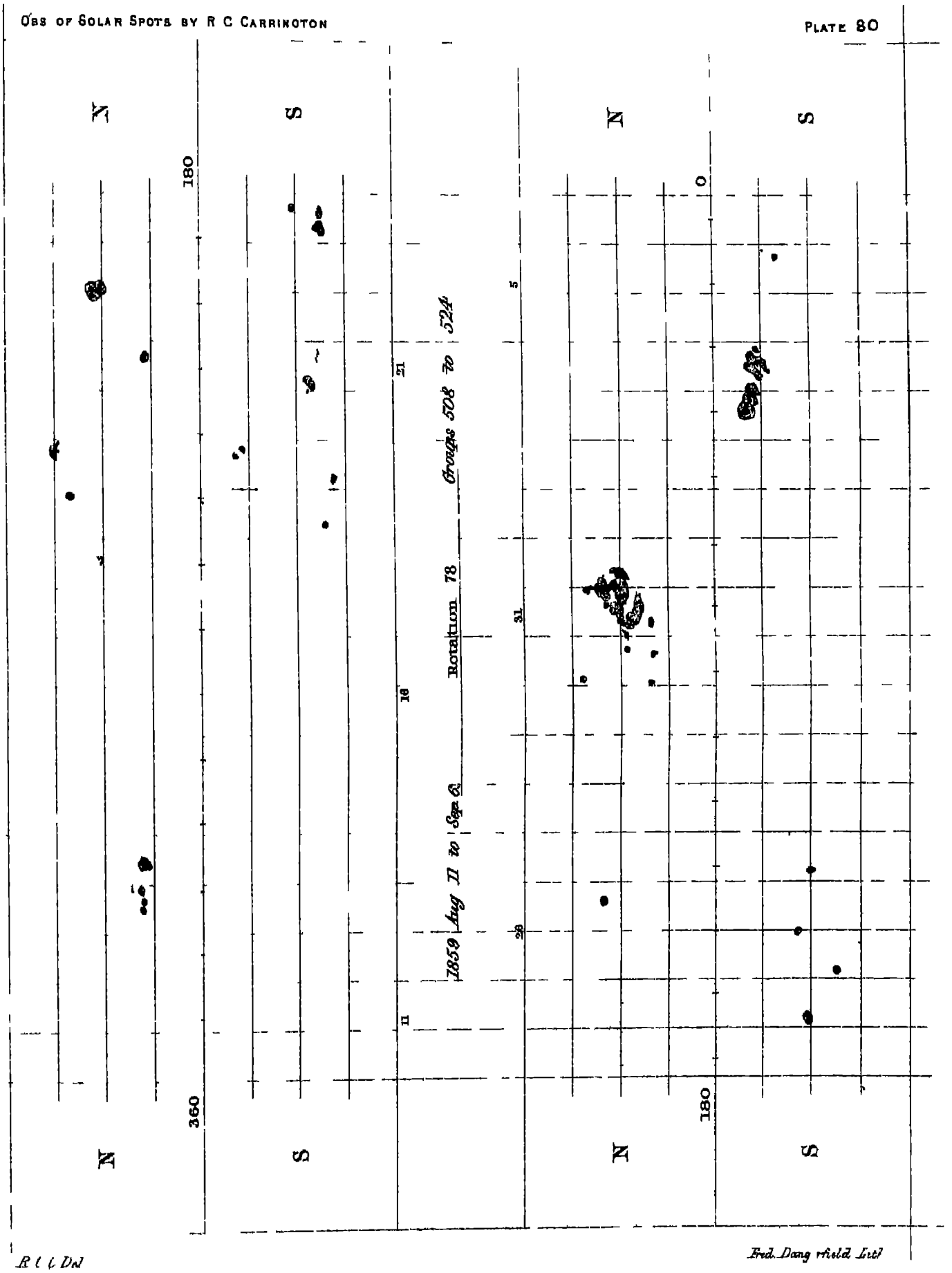
Fred D ng rfield Lith


N
S
180
360
N
S
0
180
1859 June 17 to July 13 Rotation 76. Groups 469 to 487



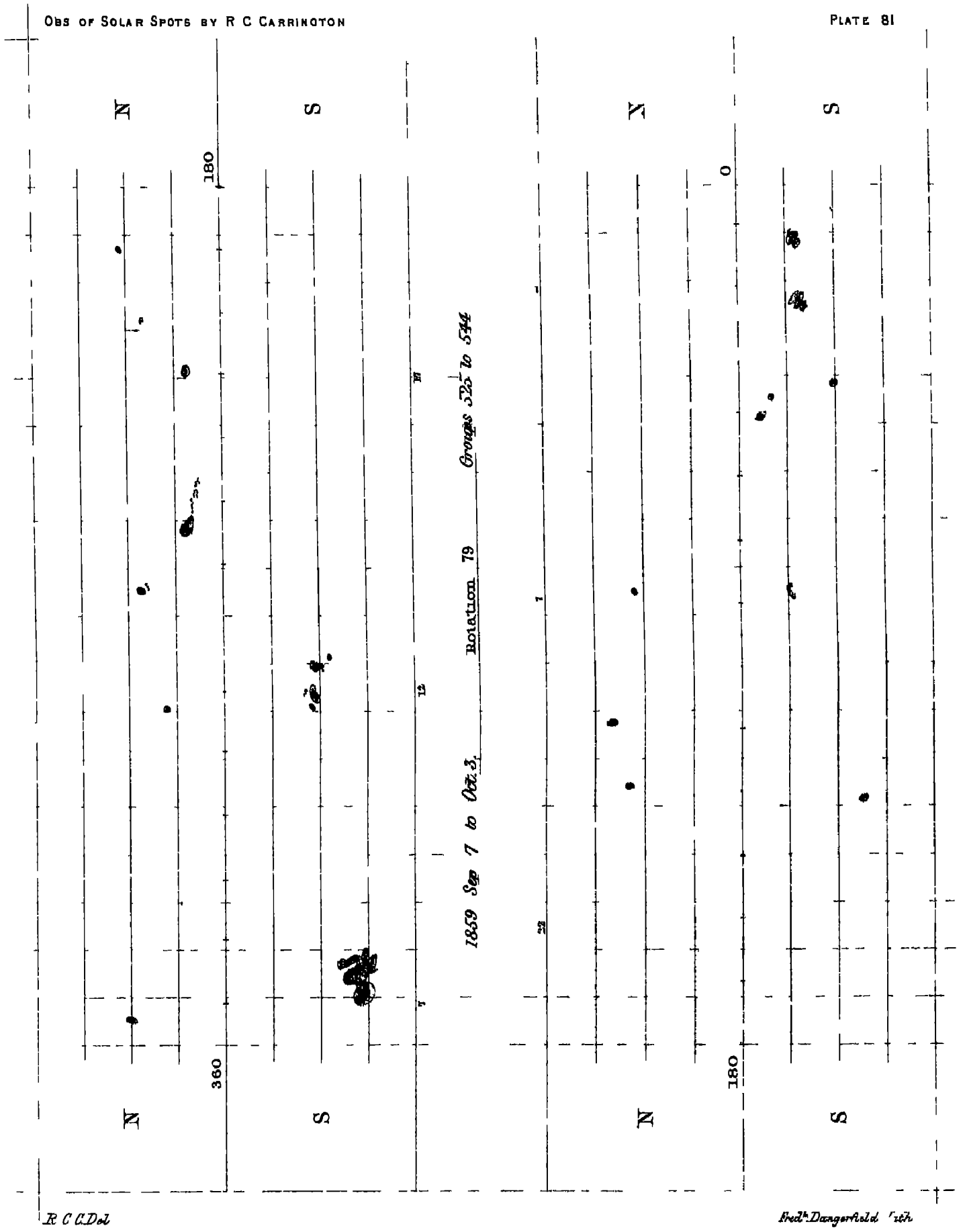
R C C D l

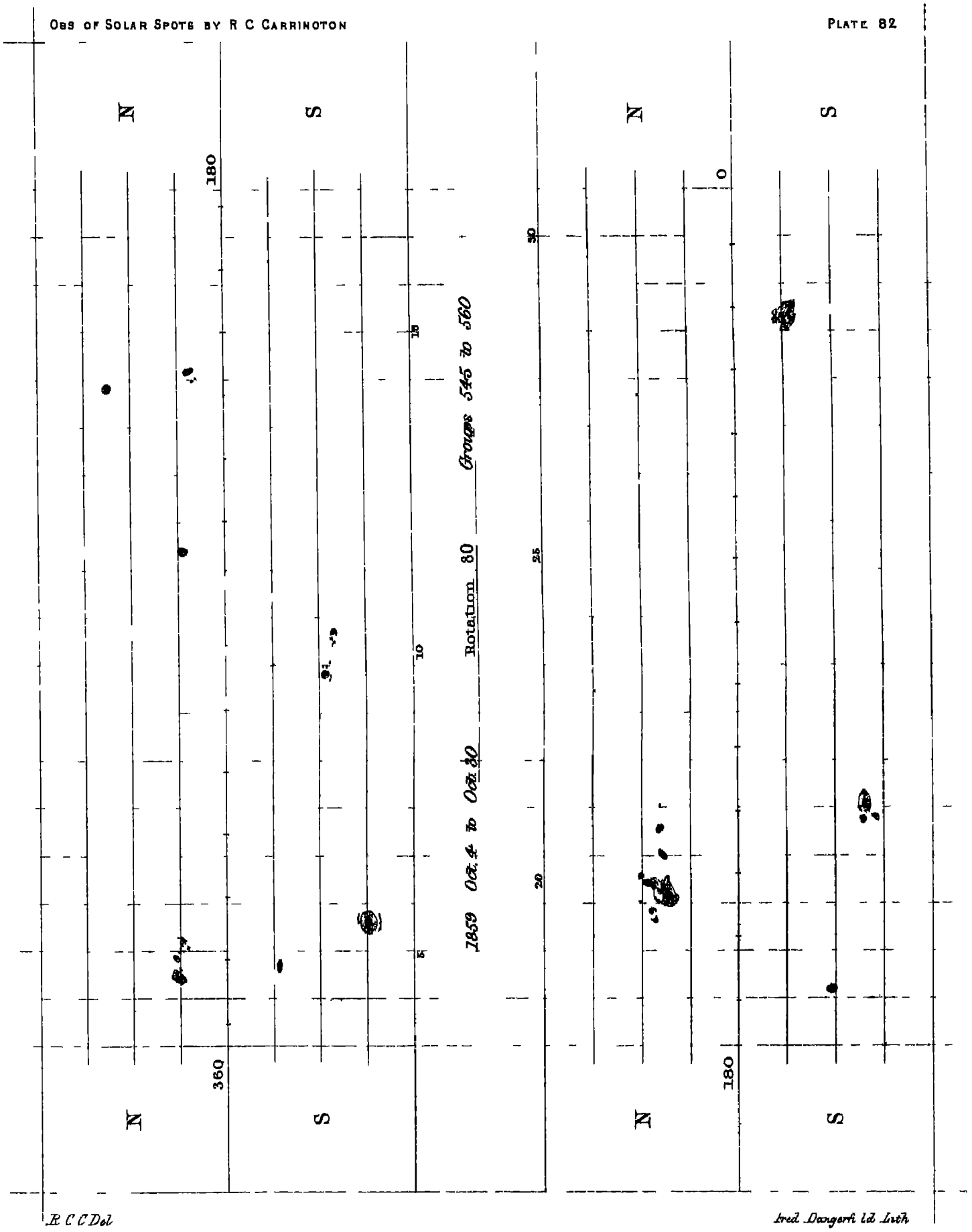
Fredk Dangerfield Lith



R C C Del

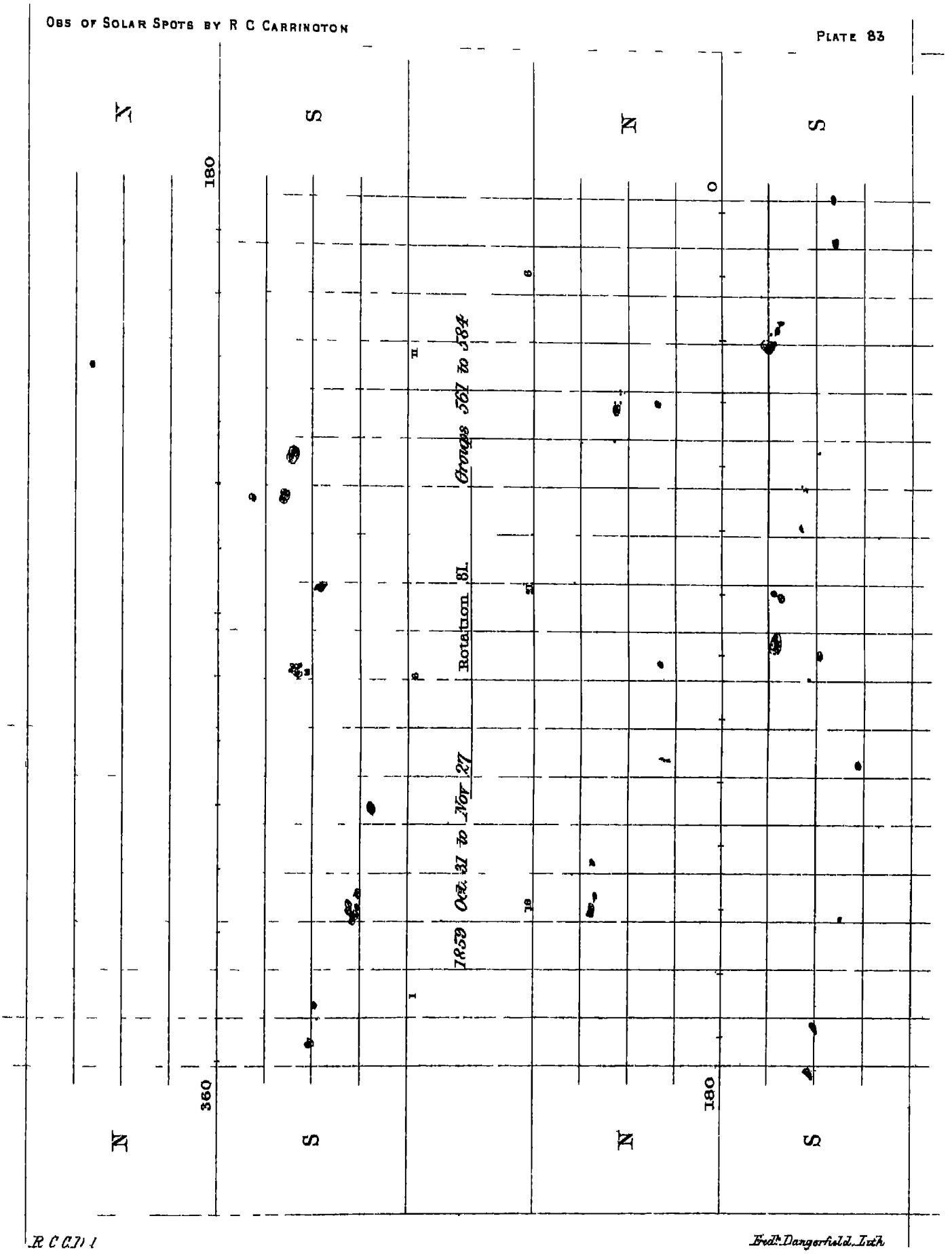
Fred. Dangerfield Lith


N
S
180
360
0
180
1859 Sep 7 to Oct 3. Rotation 79 Groups 525 to 544
R C C.Del
Fred.k Dangerfield 12th



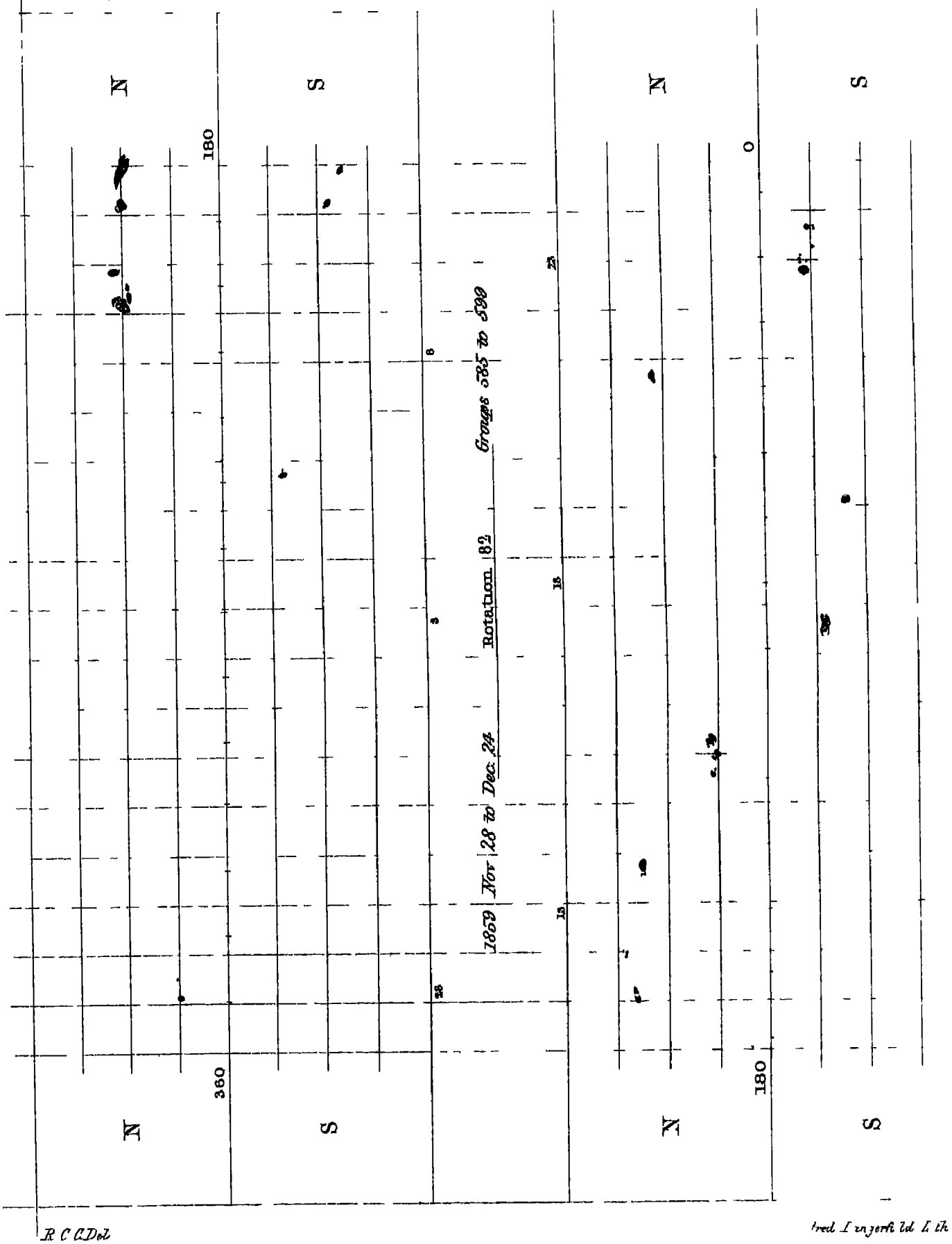
R C C Del

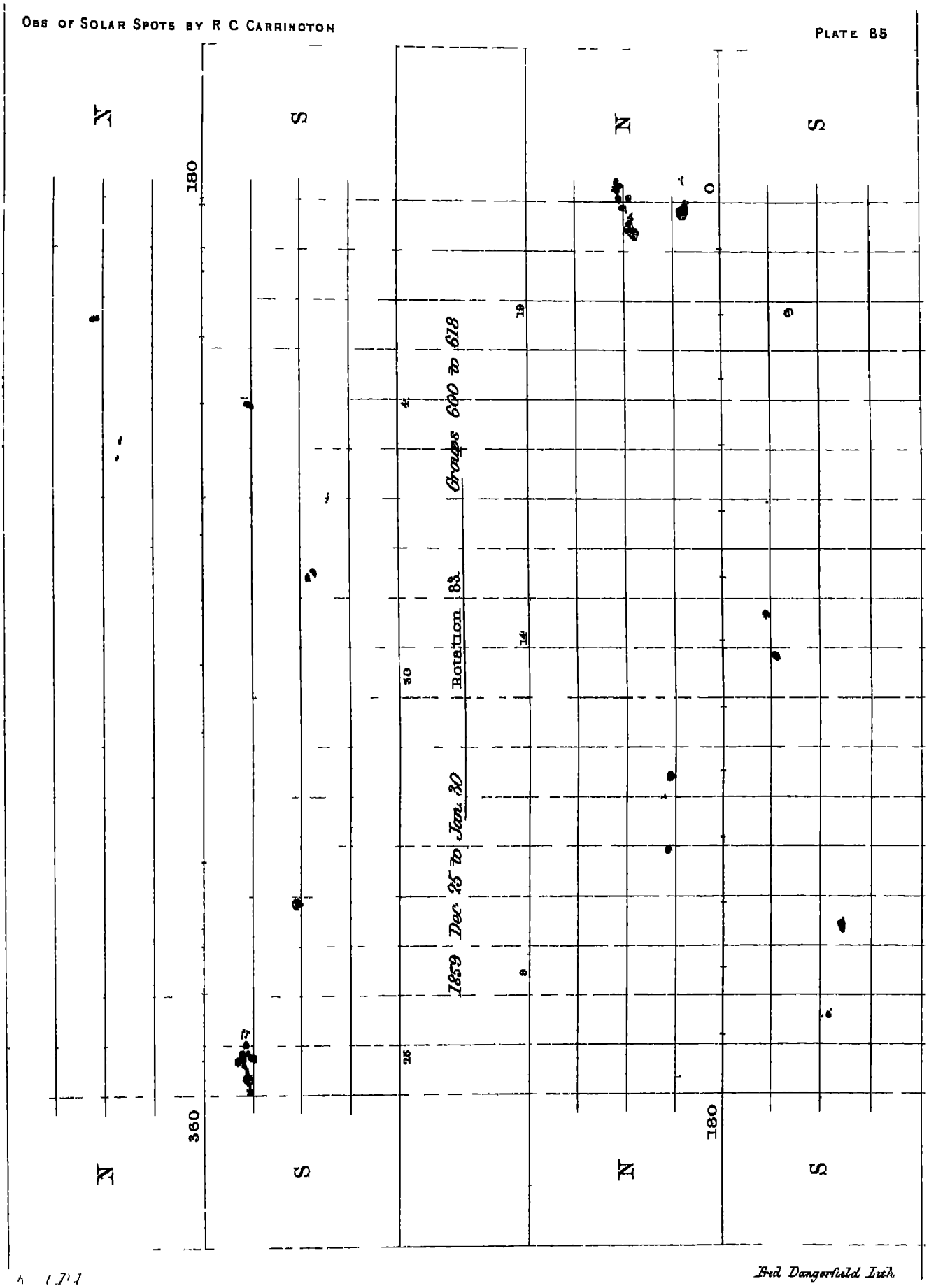
Fred. Dangerfield Lith



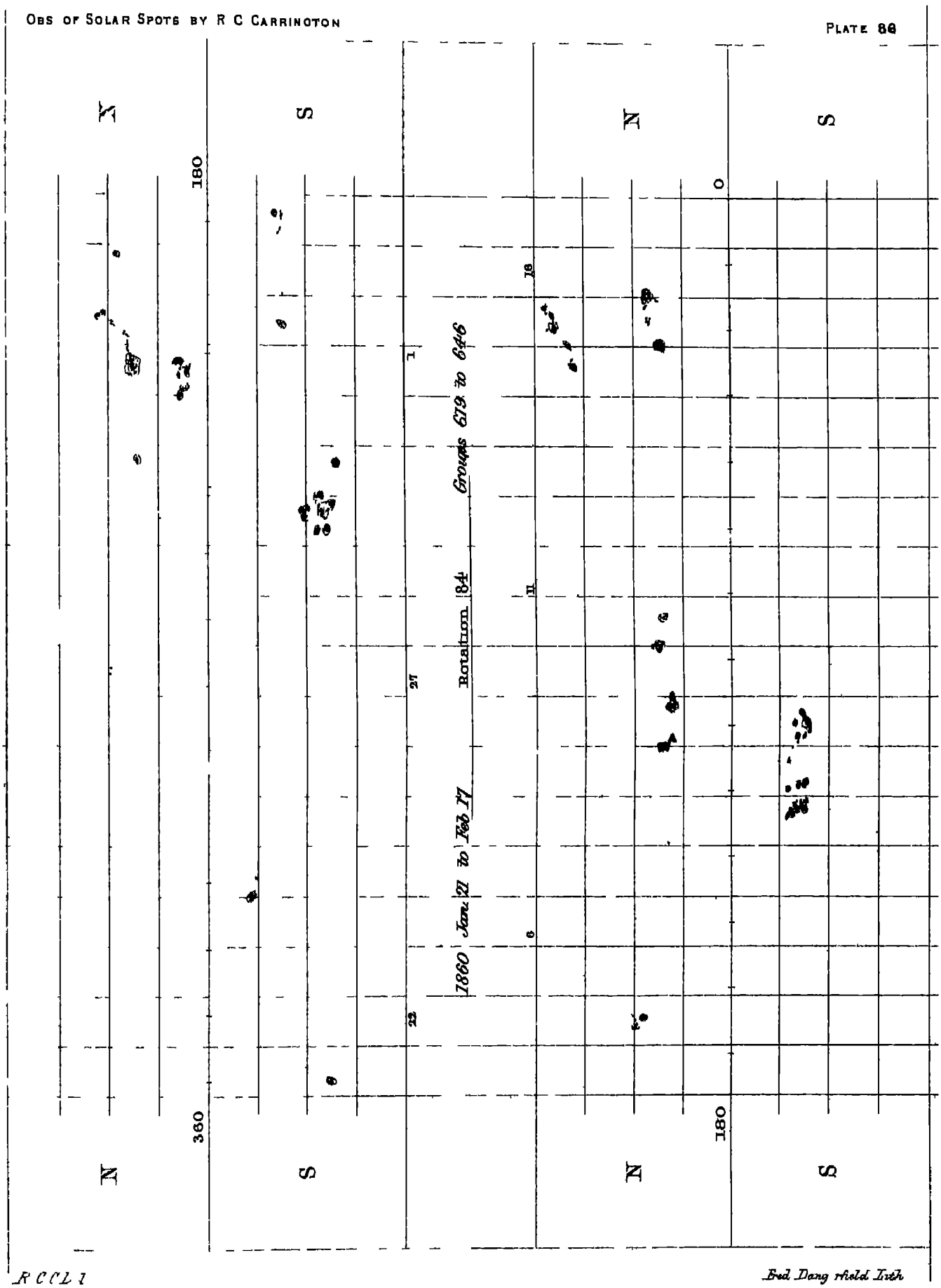
R C C.D.I

Fedk Dangerfield, Lith


N
S
180
0
360
180
1879 Nov 28 to Dec 24
Rotation 82
Groups 285 to 299
R C C Del
Fred I Ingerfield Lith

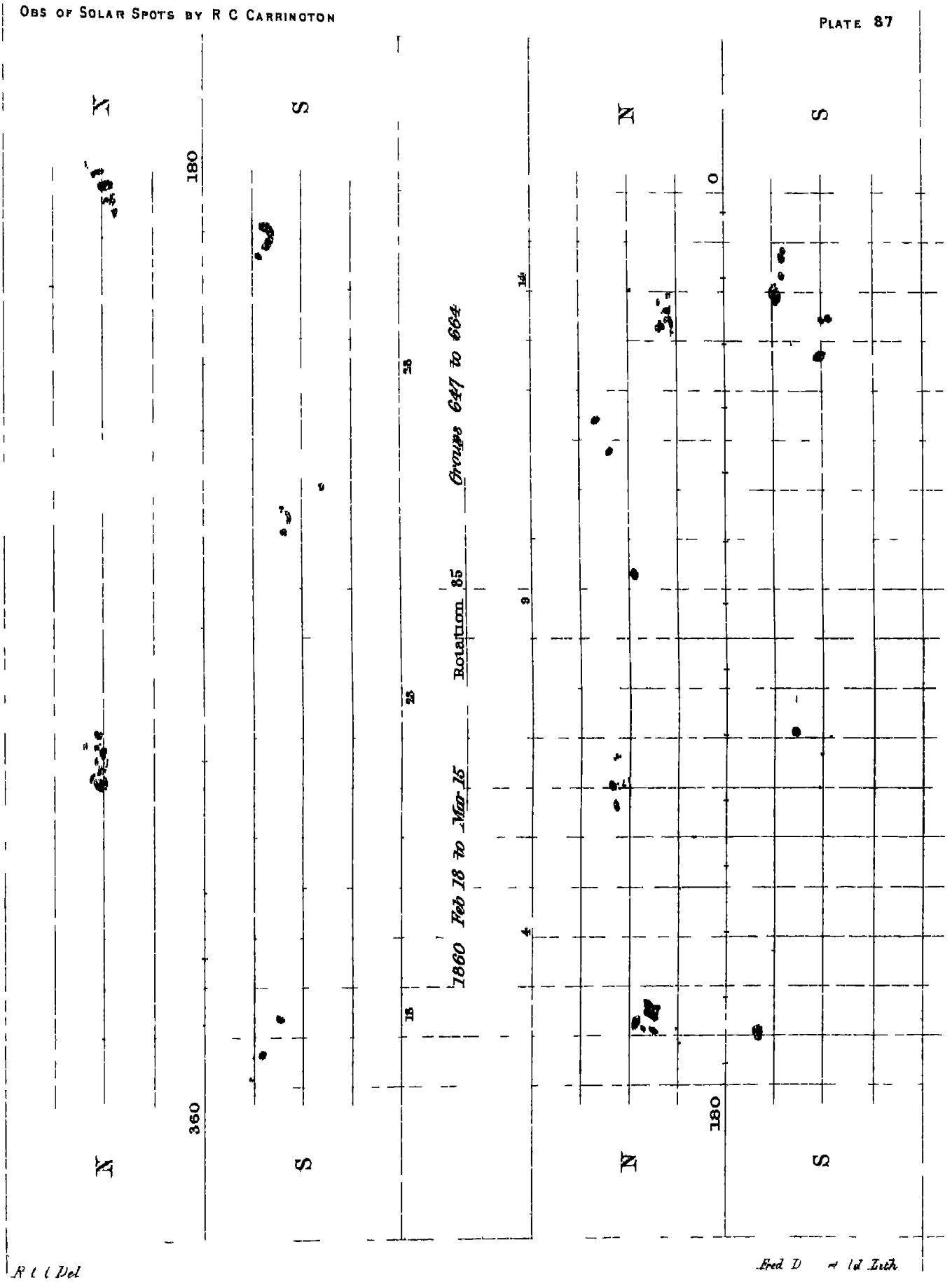


Fred Dangerfield Lith.



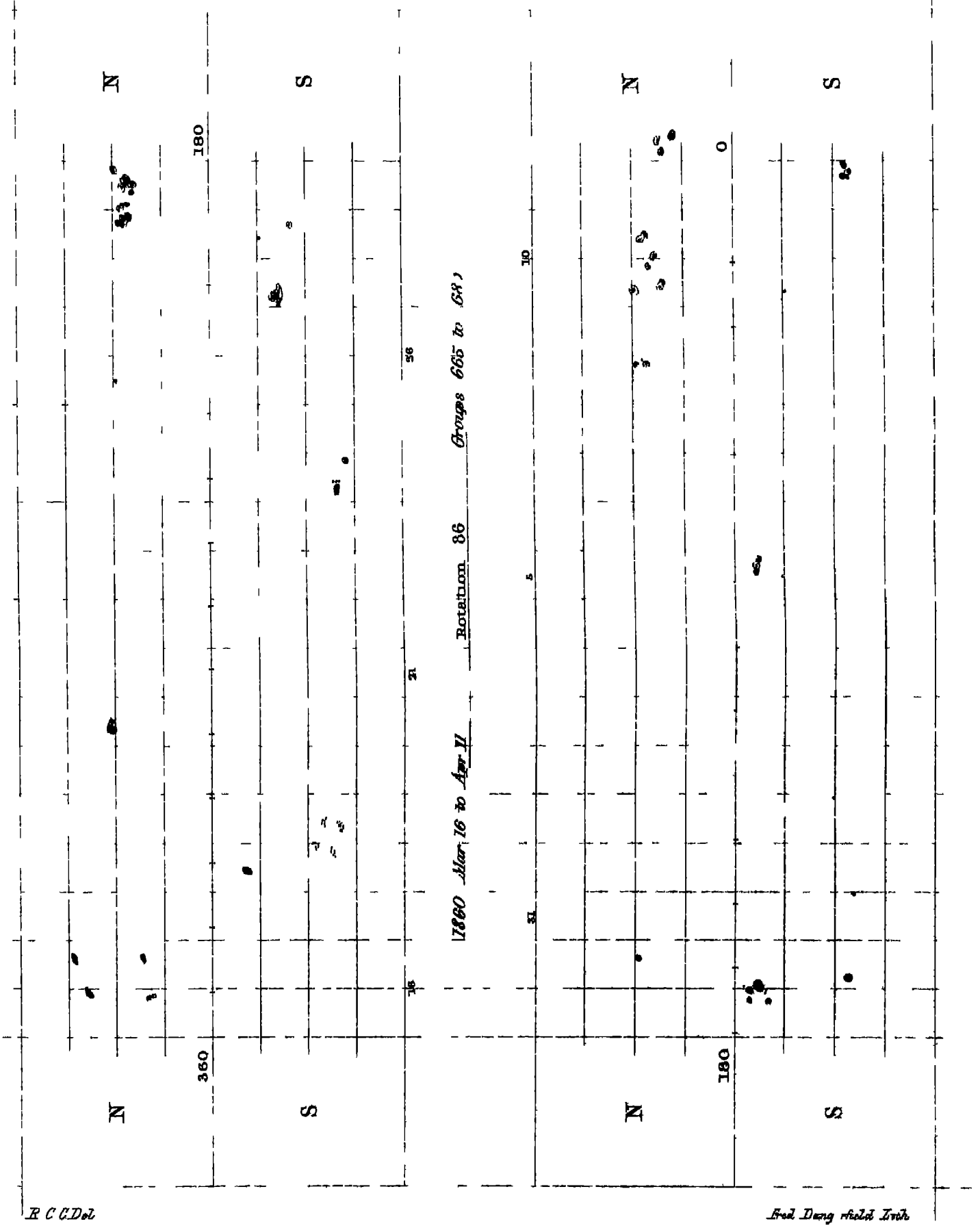
R C C L 1

Fred Dangerfield Lith



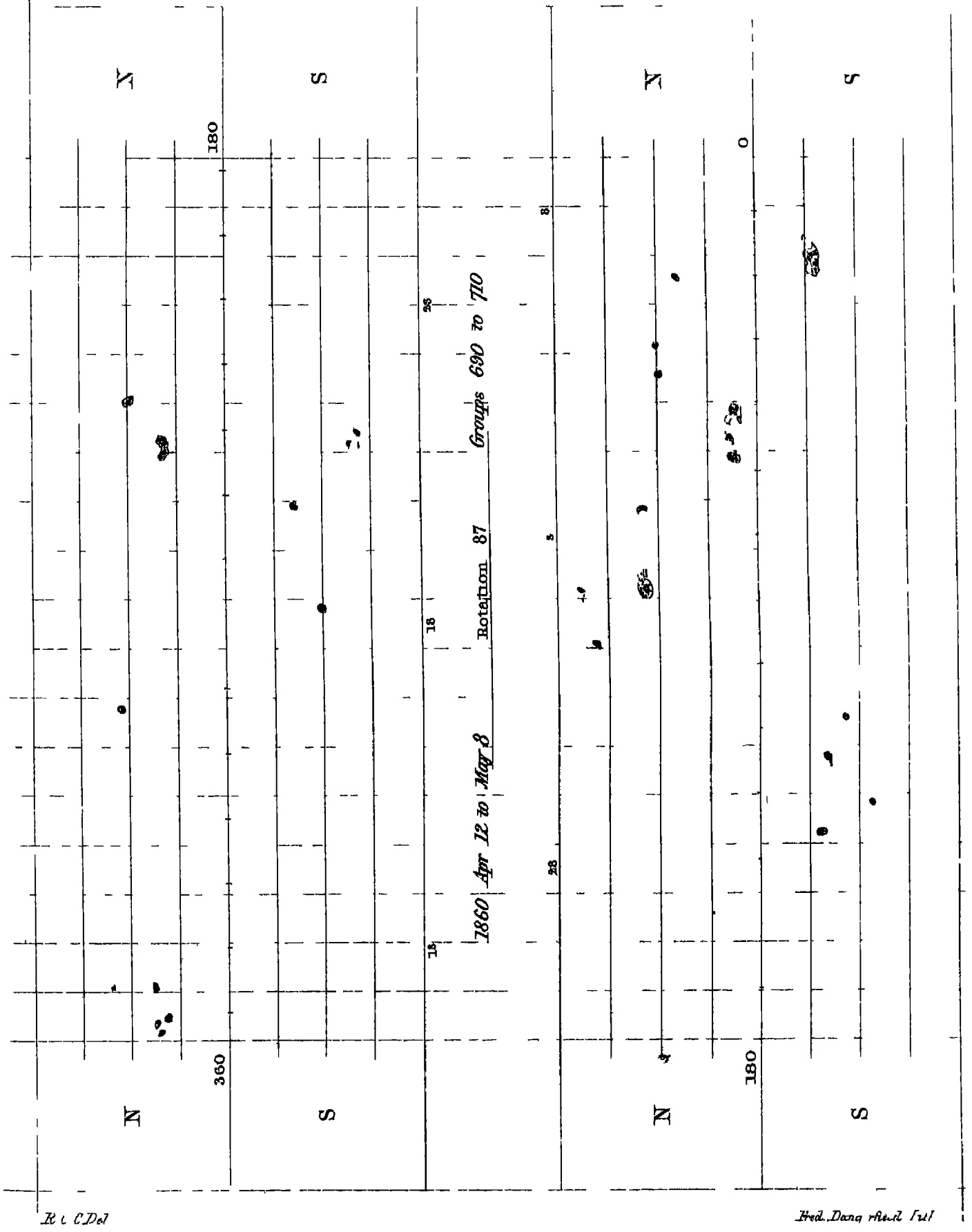
R C C Del

Fred D ... ld Lith



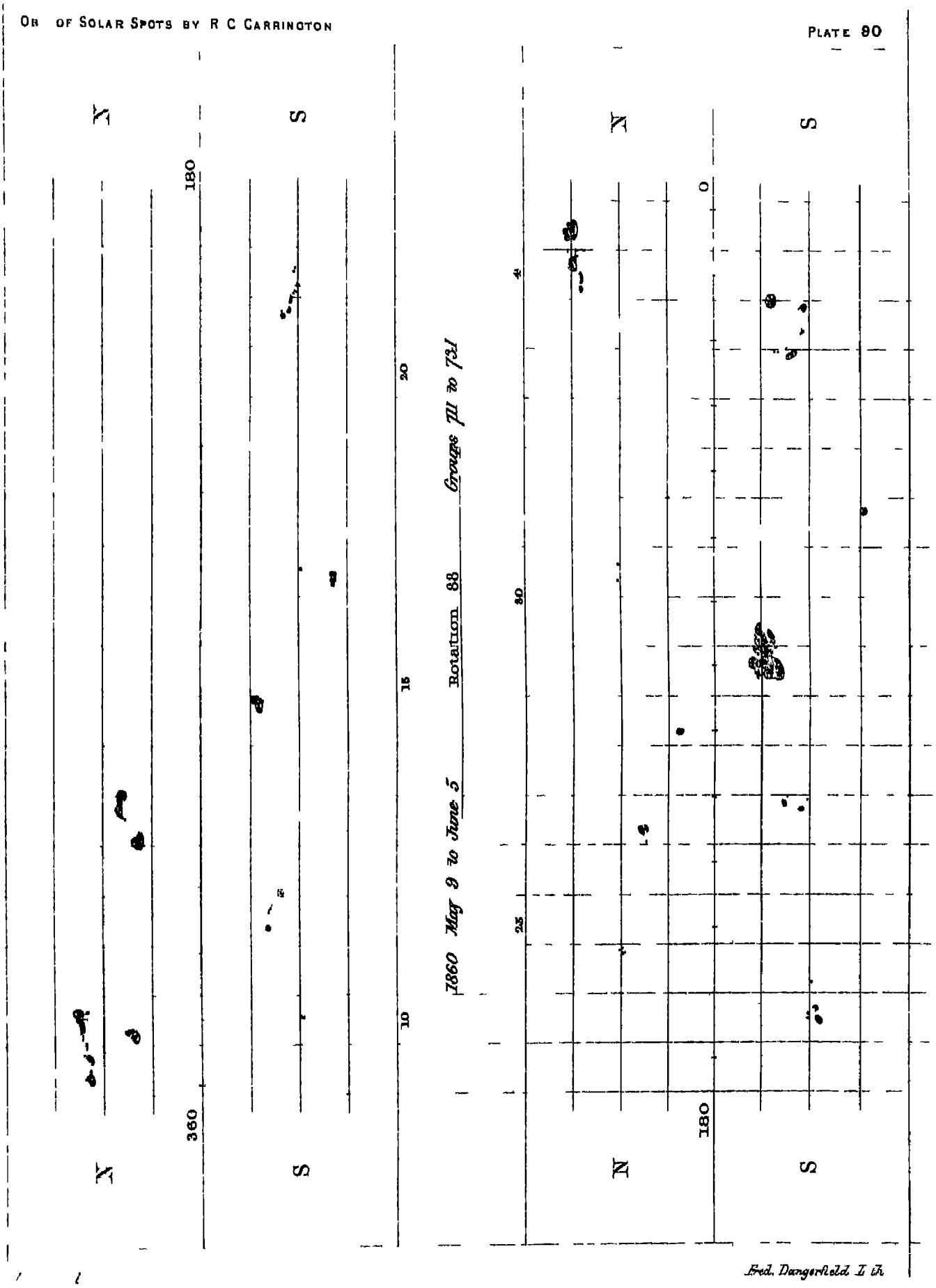
R C C Del

Fred Dangerfield Lith



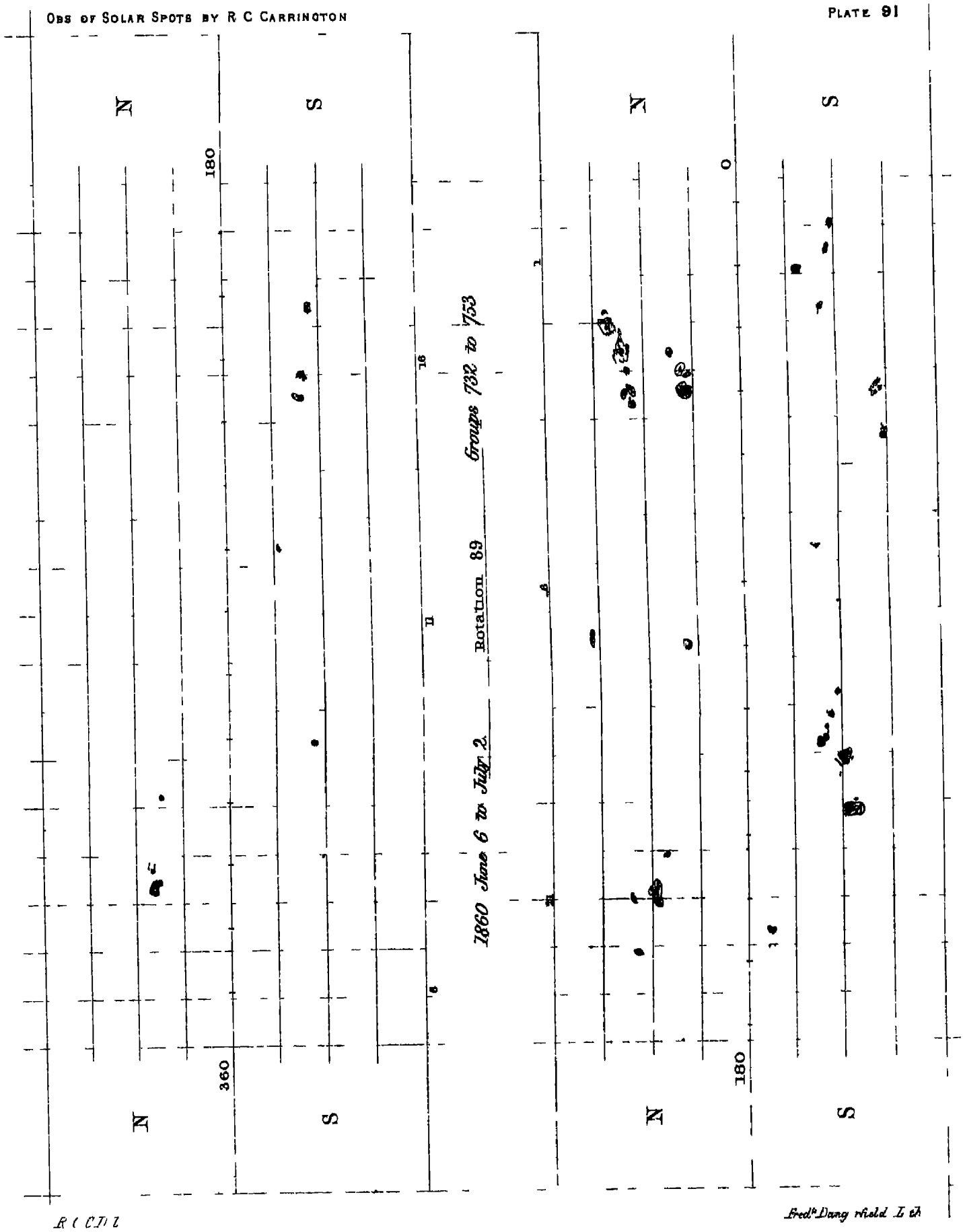
R C Del

Fred. Dangerfield Lith



1860 May 9 to June 5 Rotation 88 Groups 711 to 731

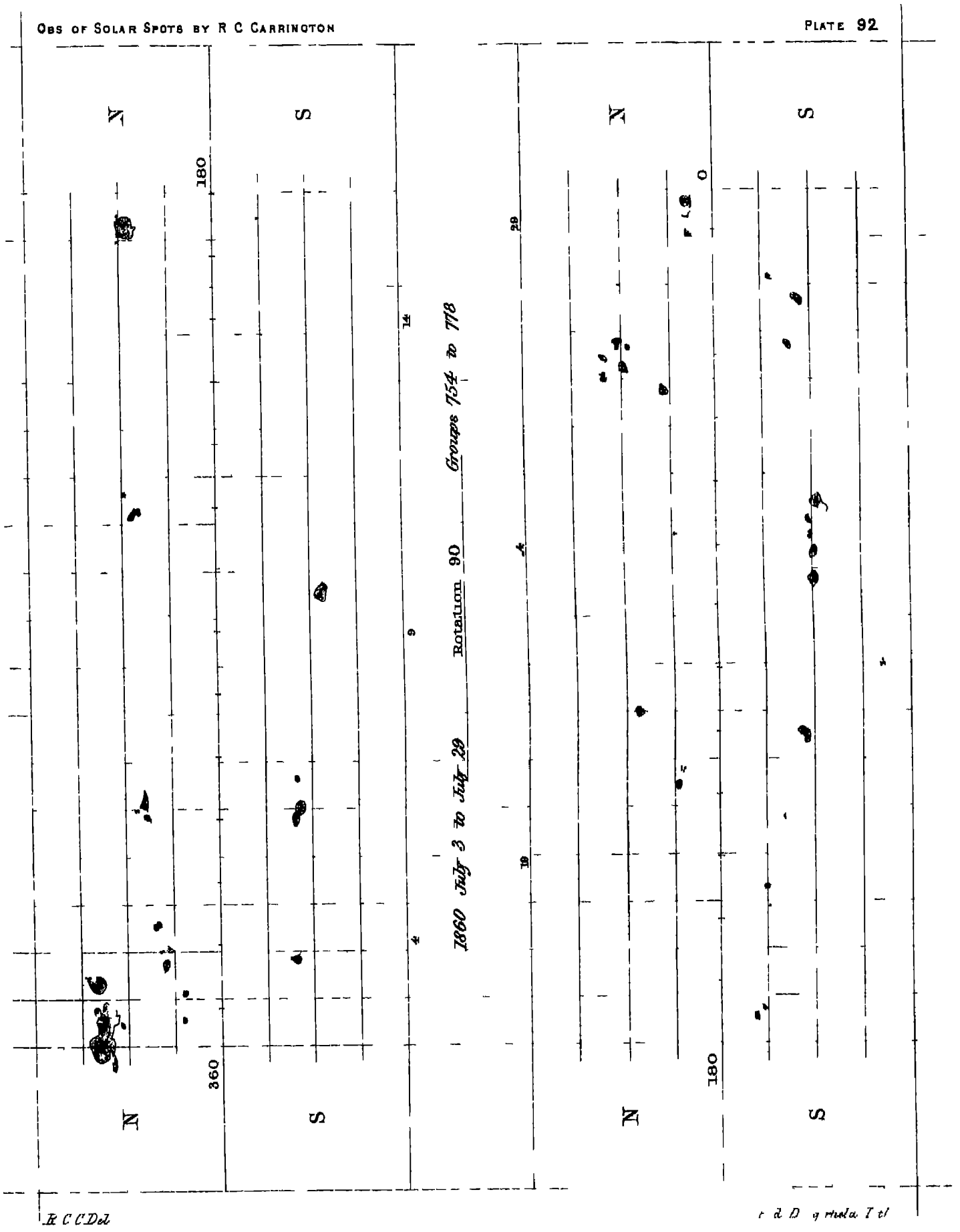
Fred. Dangerfield. Lith.

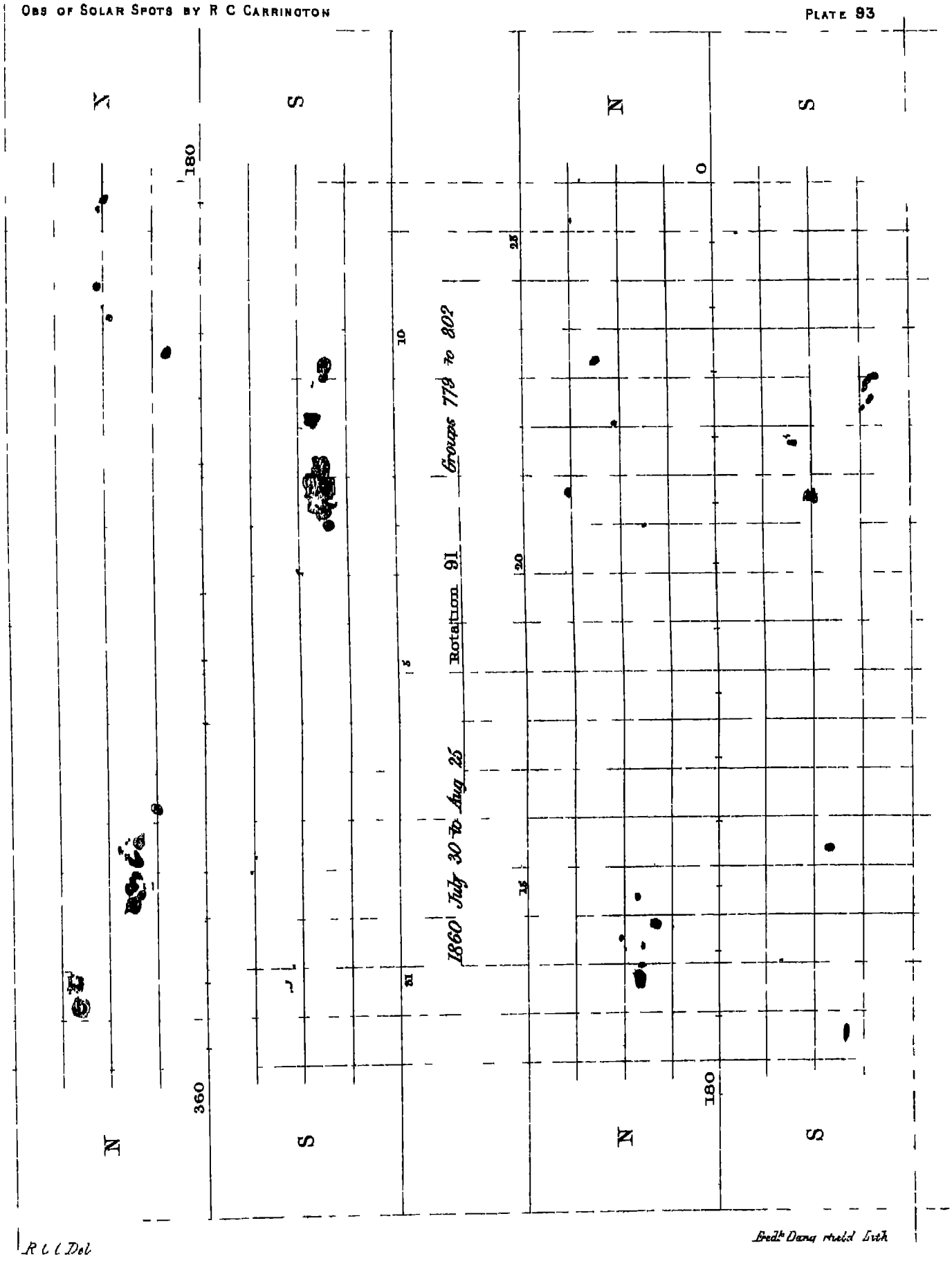


1860 June 6 to July 2. Rotation 89 Groups 732 to 753

R C Carrington

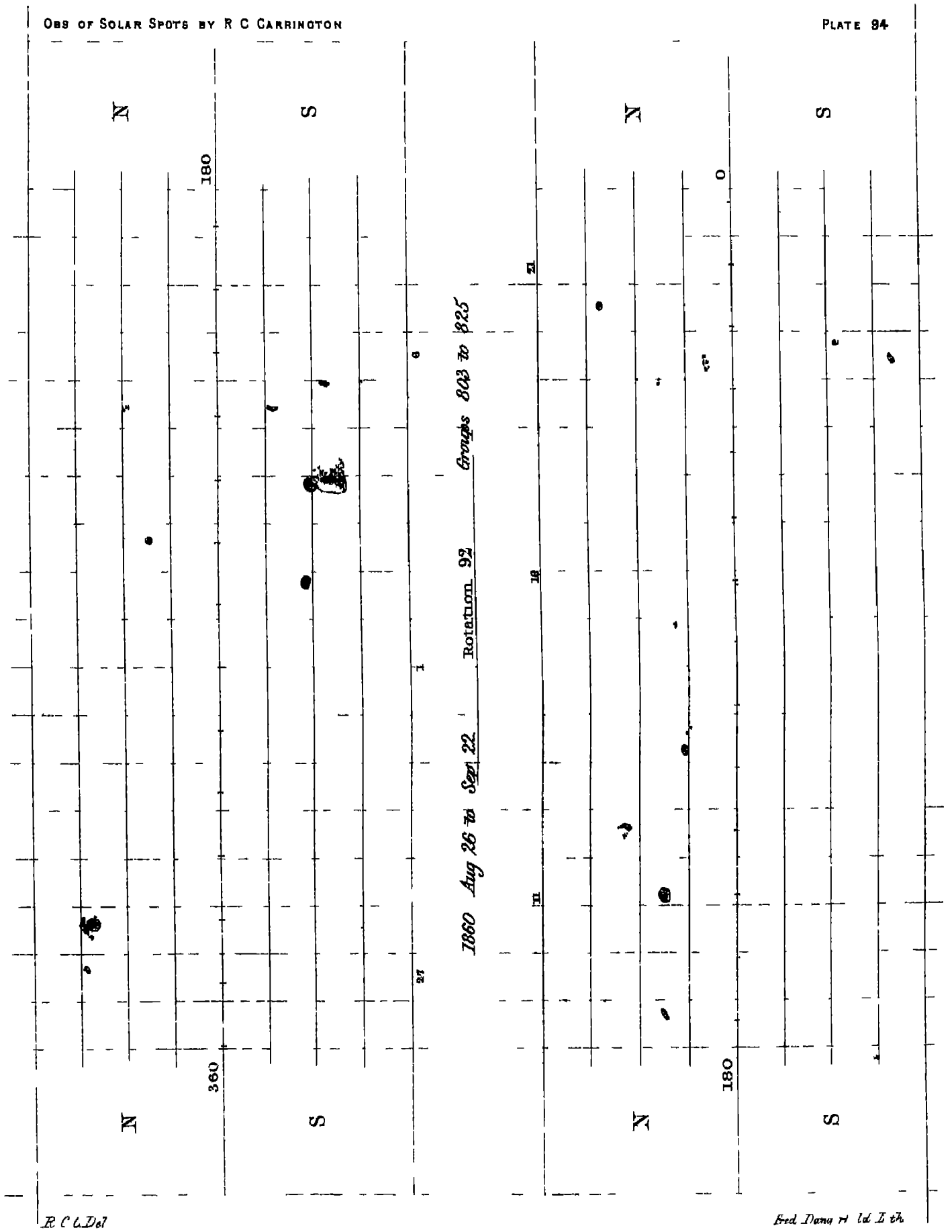
Fred^k Dangerfield Lith


N
S
180
360
0
1860 July 3 to July 29
Rotation 90
Groups 754 to 778
14
9
4
29
19
R C C Del



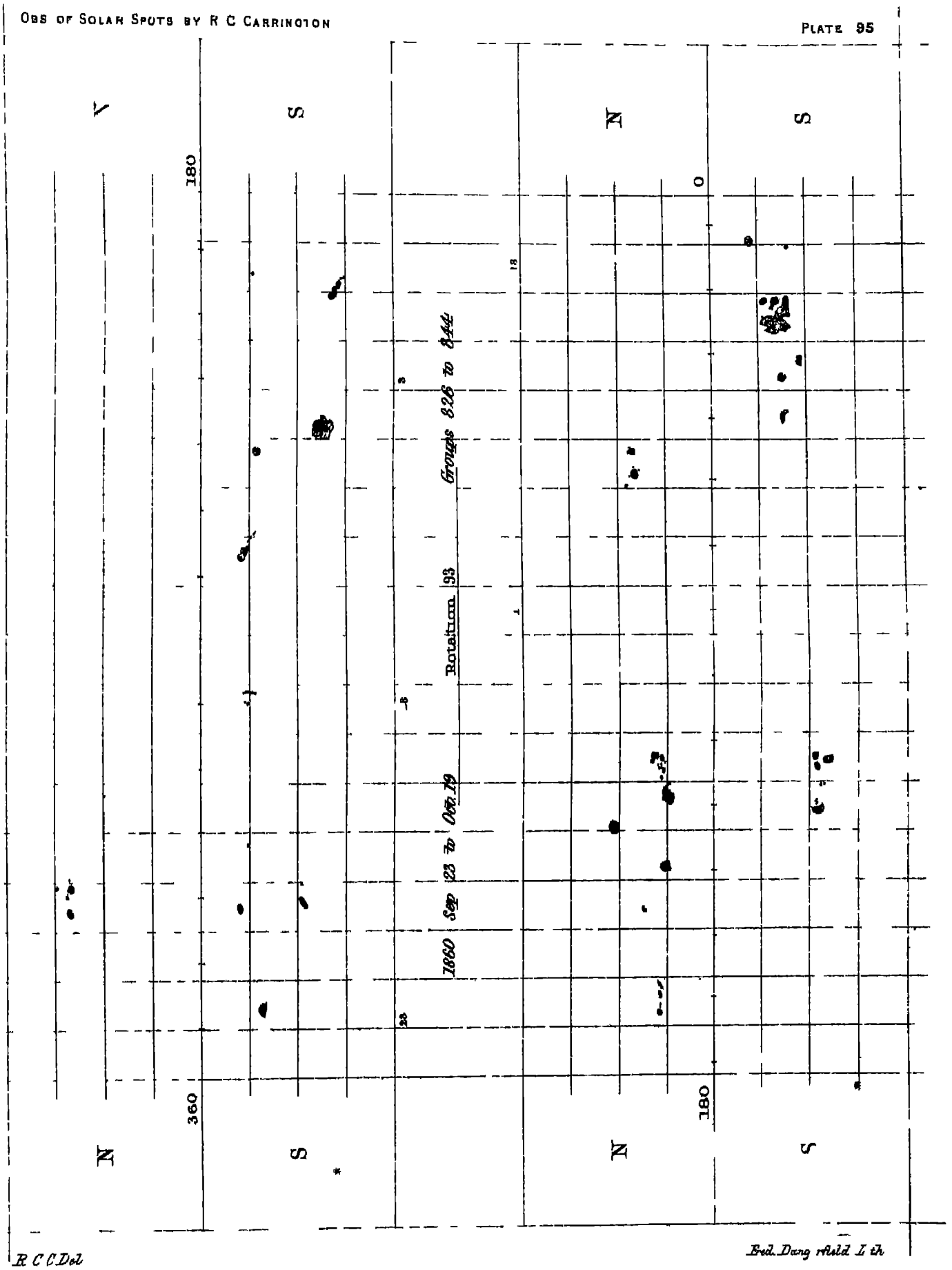
R C C Del

Fredk Dangerfield Lith



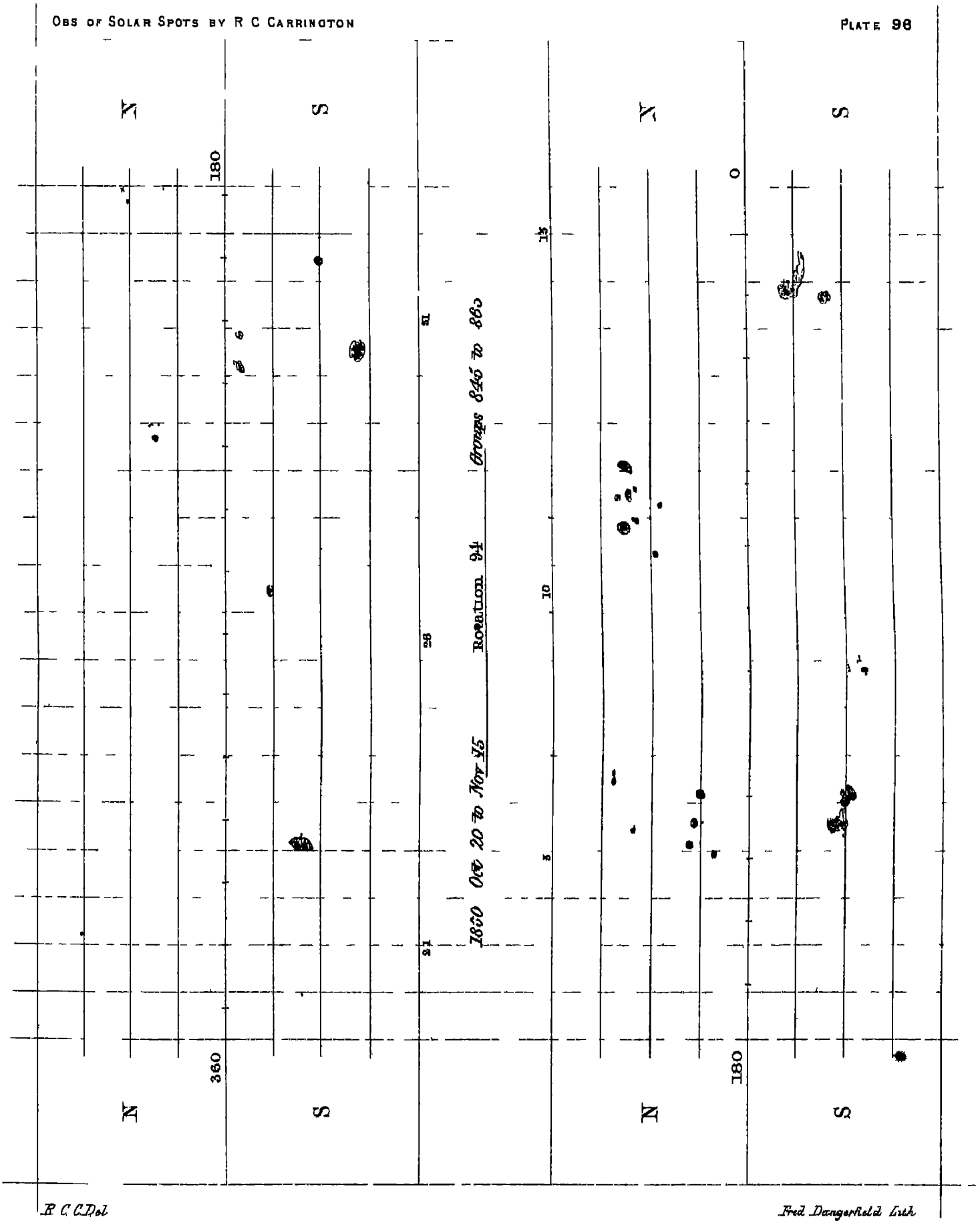
R C C. Del

Fred Dang H ld L th



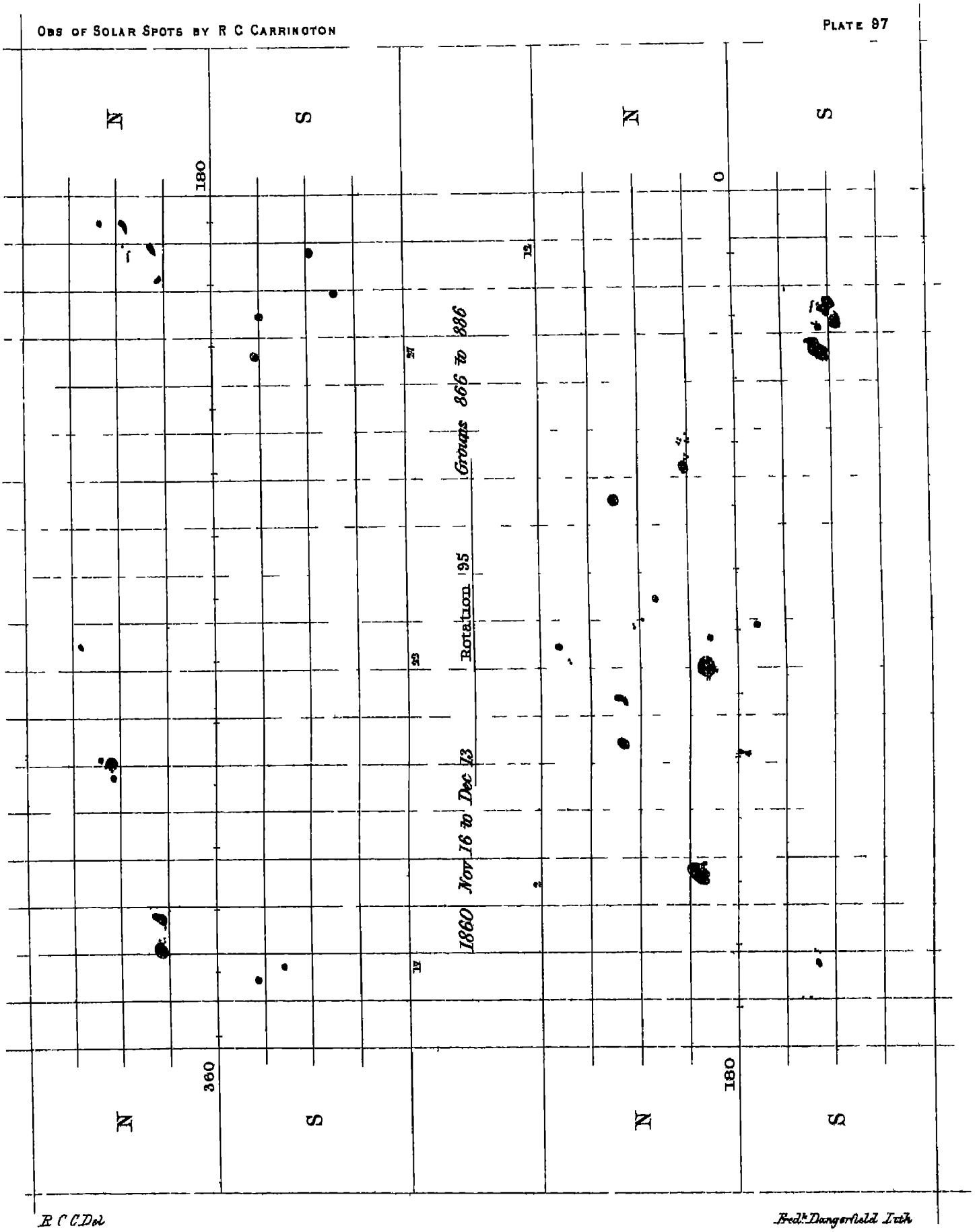
R C C Del

Fred. Dangerfield Lith



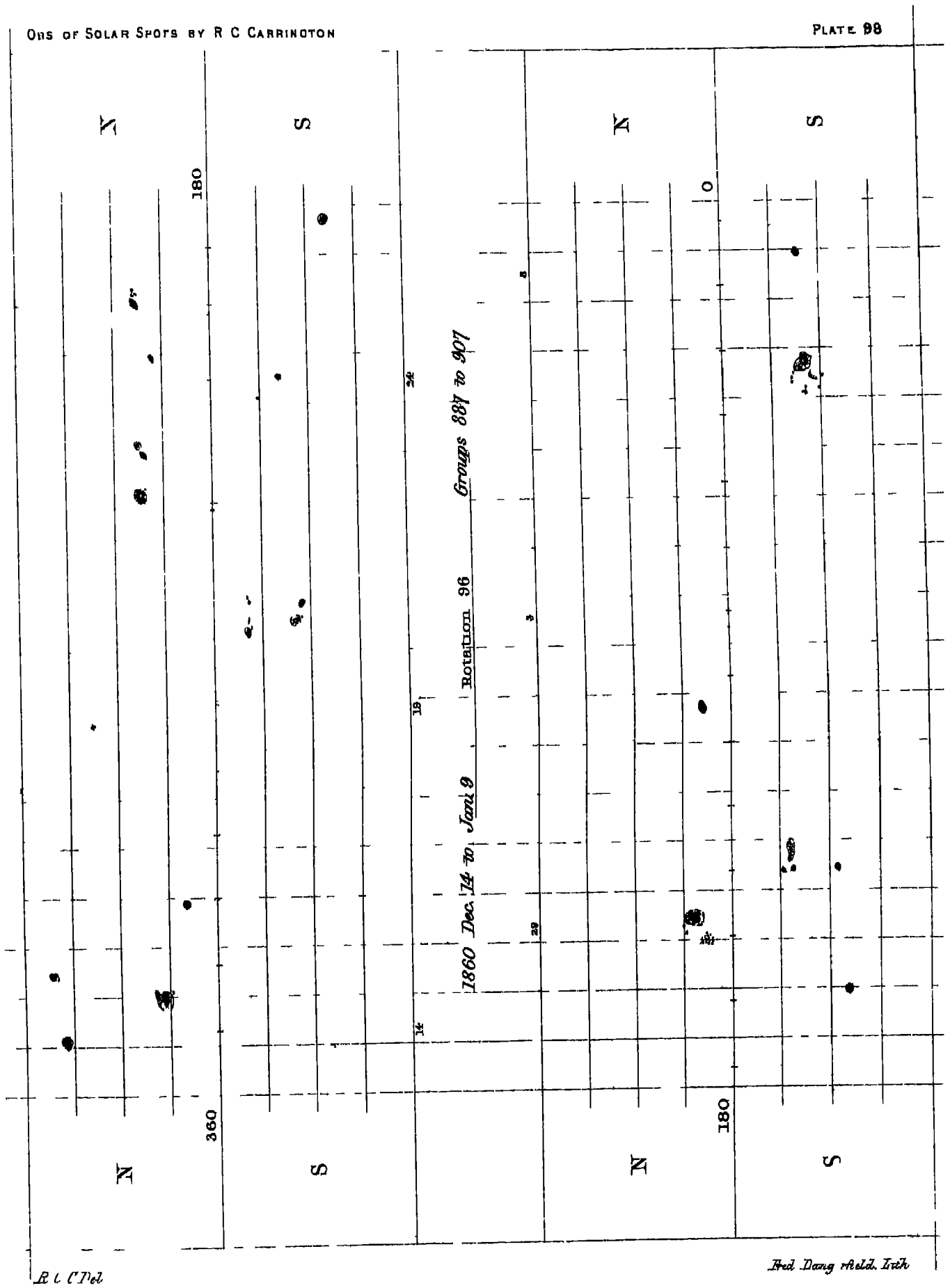
R C C.Del

Fred Dangerfield Lith



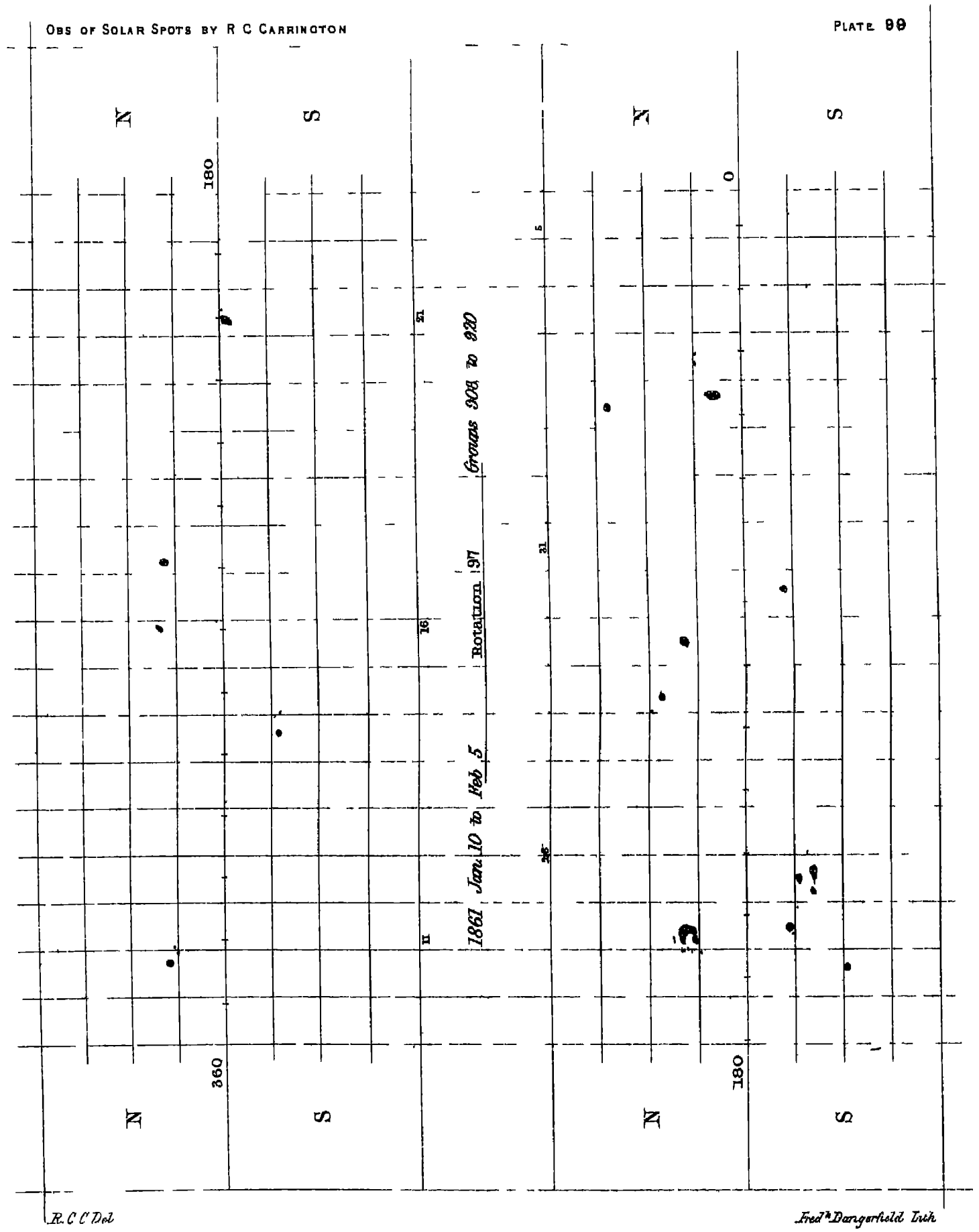
R C C Del

Fredk Dangerfield Lith



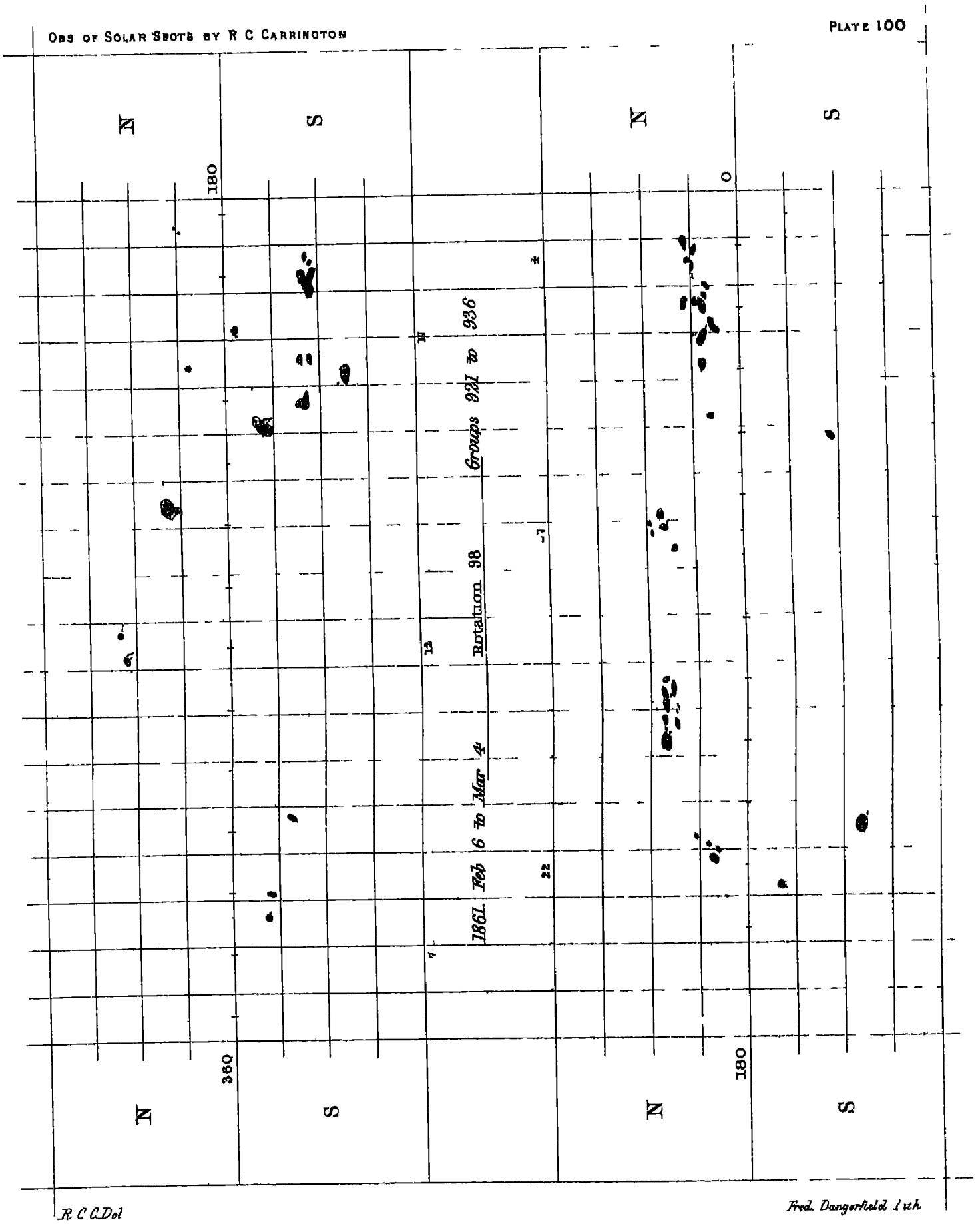
R C C Del

Fred Dangerfield. Lith


N
S
180
360
0
180
1861 Jan. 10 to Feb. 5
Rotation 197
Groups 908 to 930
R. C. C. Del.
Fred.k Dangerfield Lith.

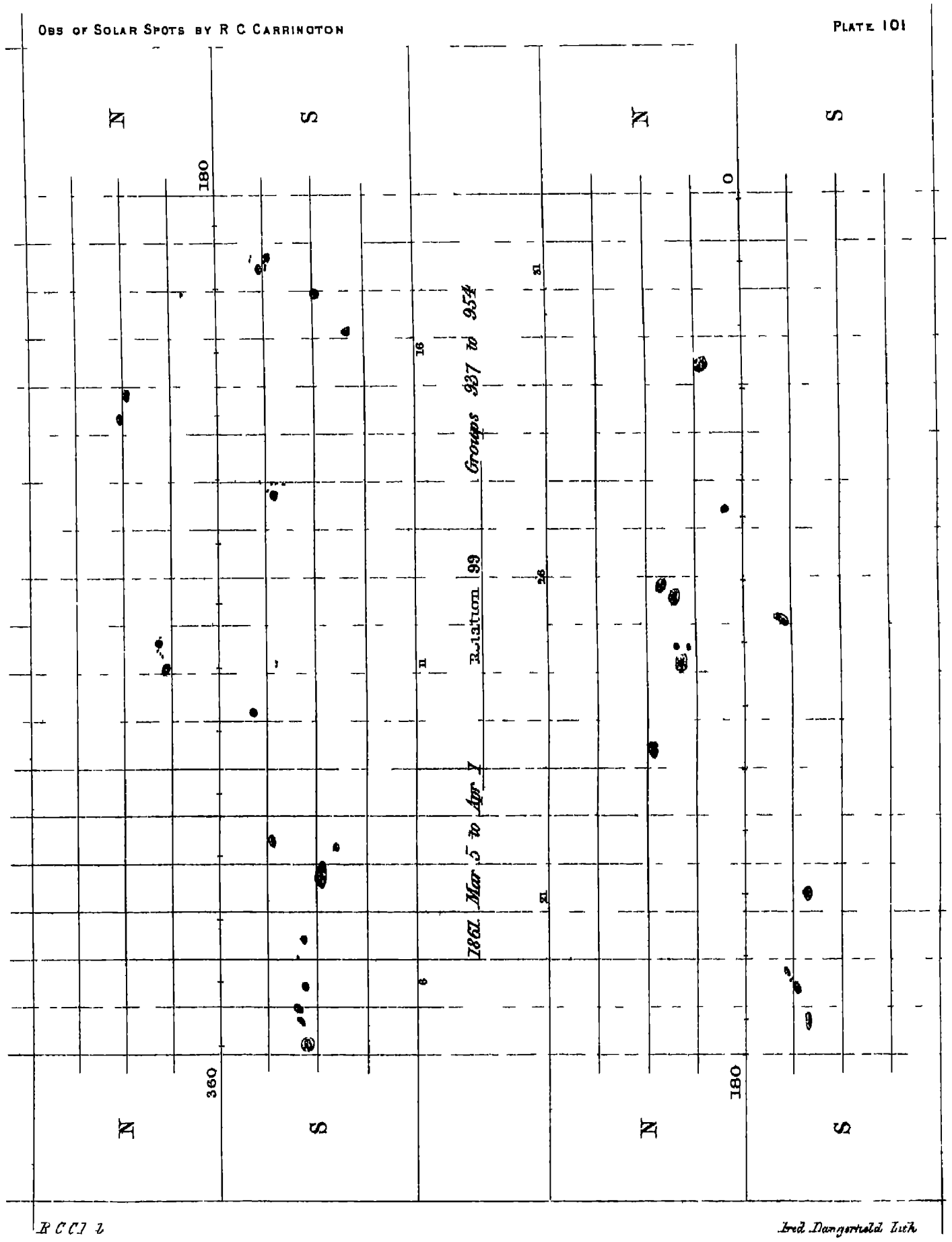
Obs of Solar Spots by R C Carrington

Plate 100



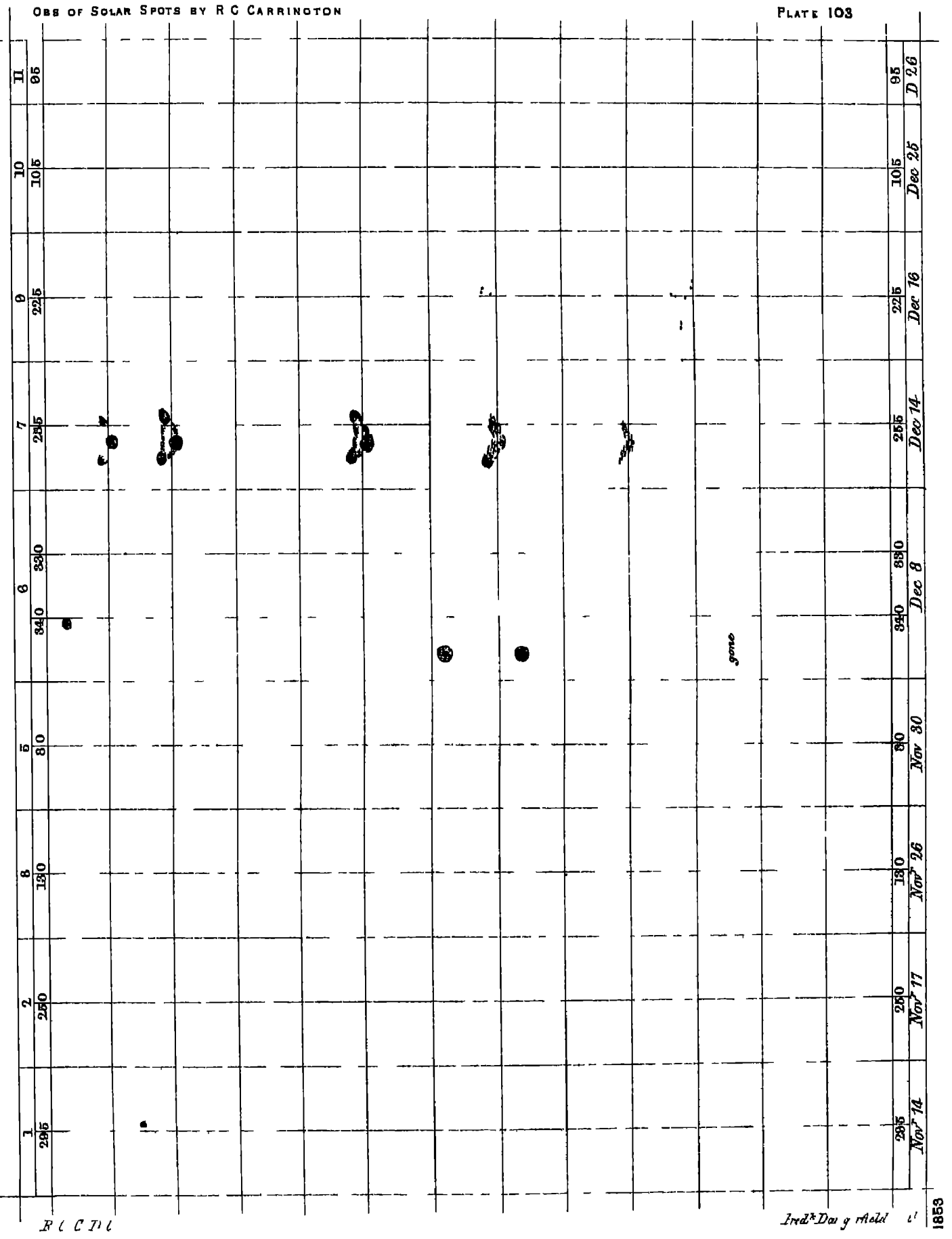
R C C.Del

Fred. Dangerfield 1 vth



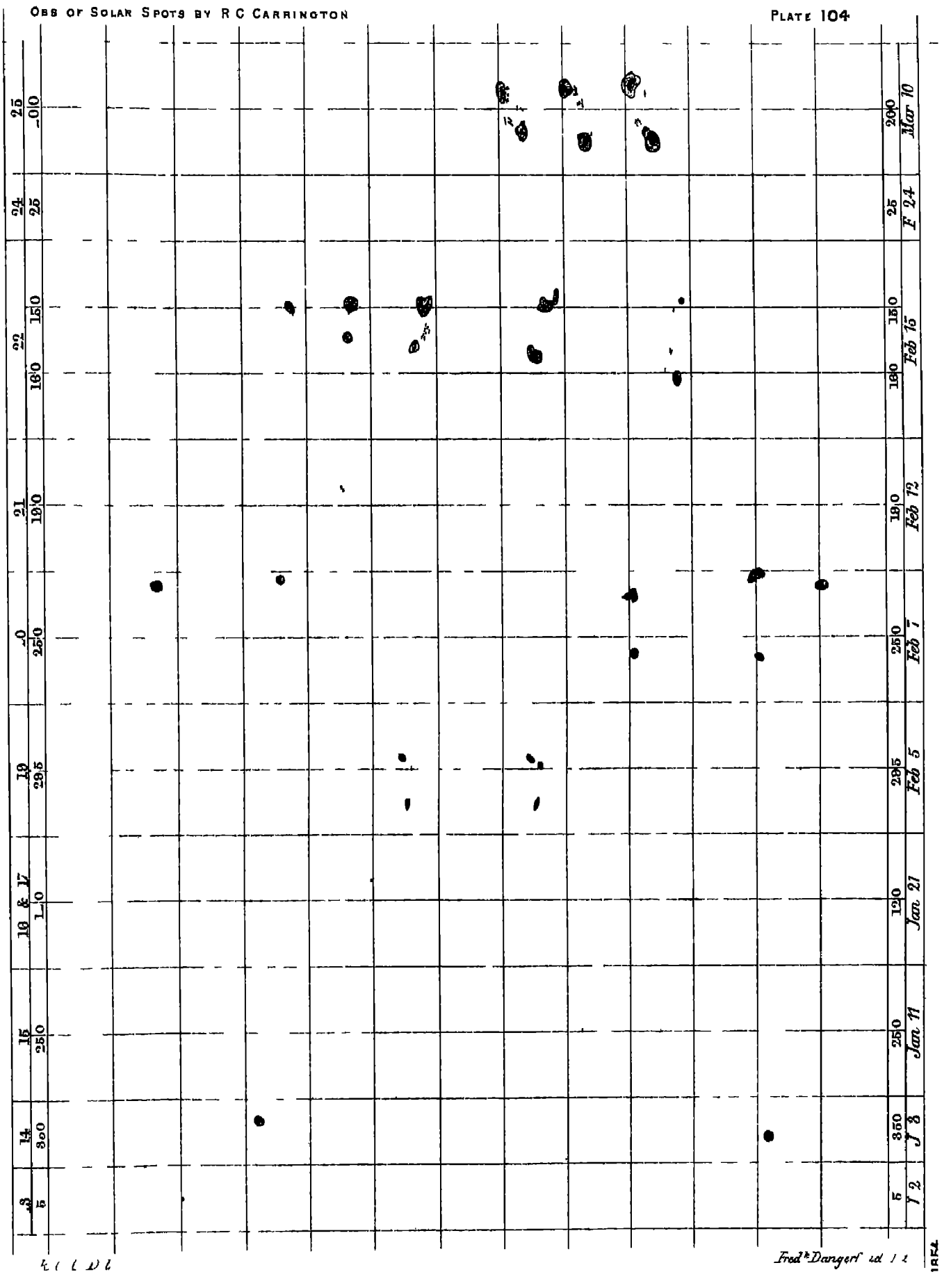
R C C I 2

Fred Dangerfield Lith

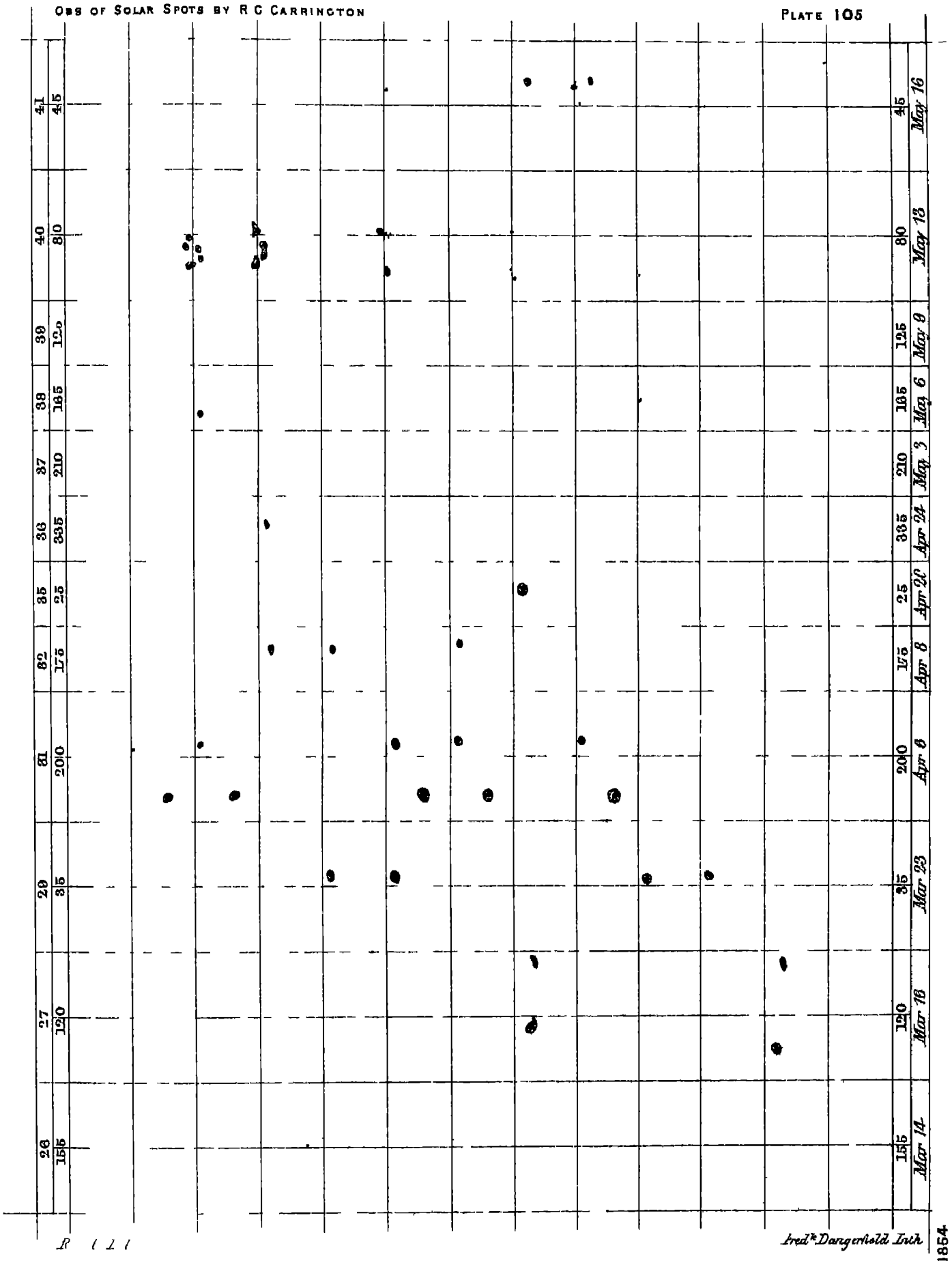

Obs of Solar Spots by R C Carrington
Plate 103
11
10
9
7
6
5
2
1
95
105
225
255
330
340
80
130
250
295
D 26
Dec 25
Dec 16
Dec 14
Dec 8
Nov 30
Nov 26
Nov 17
Nov 14
gone
1853

Obs of Solar Spots by R C Carrington

Plate 104

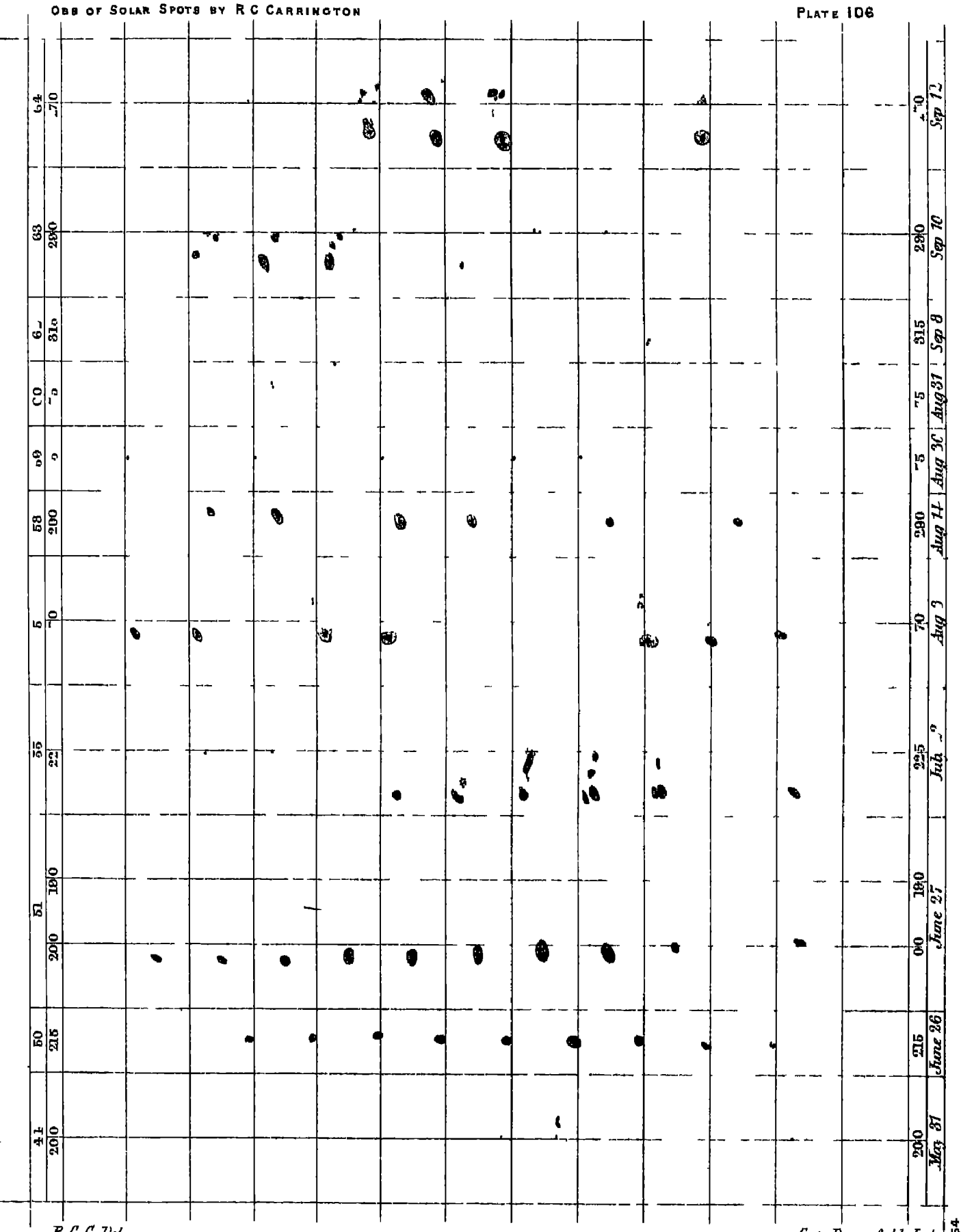


Fred^k Dangerf ad l l


Obs of Solar Spots by R C Carrington
Plate 105
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
May 16
May 13
May 9
May 6
May 3
Apr 24
Apr 20
Apr 8
Apr 6
Mar 23
Mar 16
Mar 14
Fred.k Dangerfield Lith.
1864

Obs of Solar Spots by R C Carrington

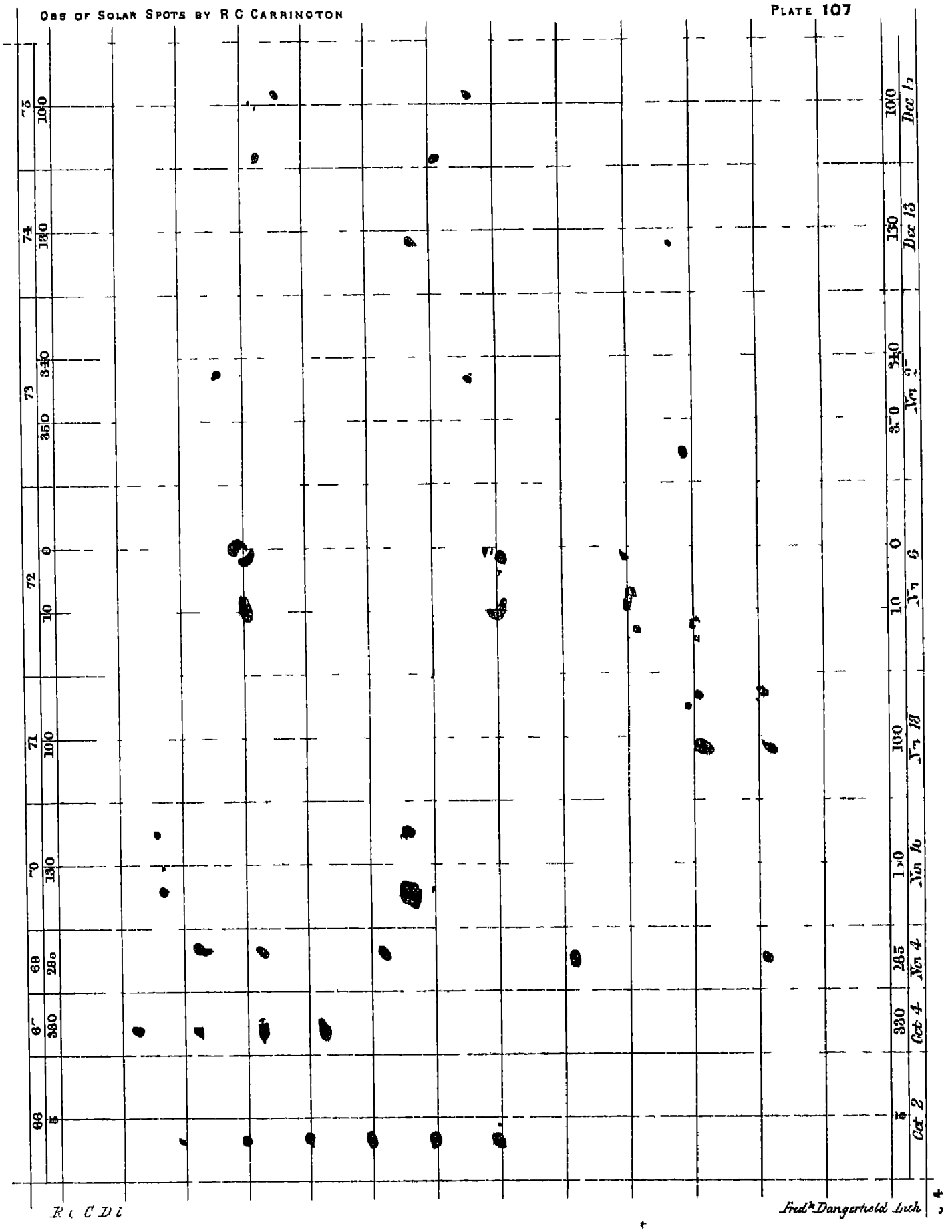
Plate 106



R C C Del

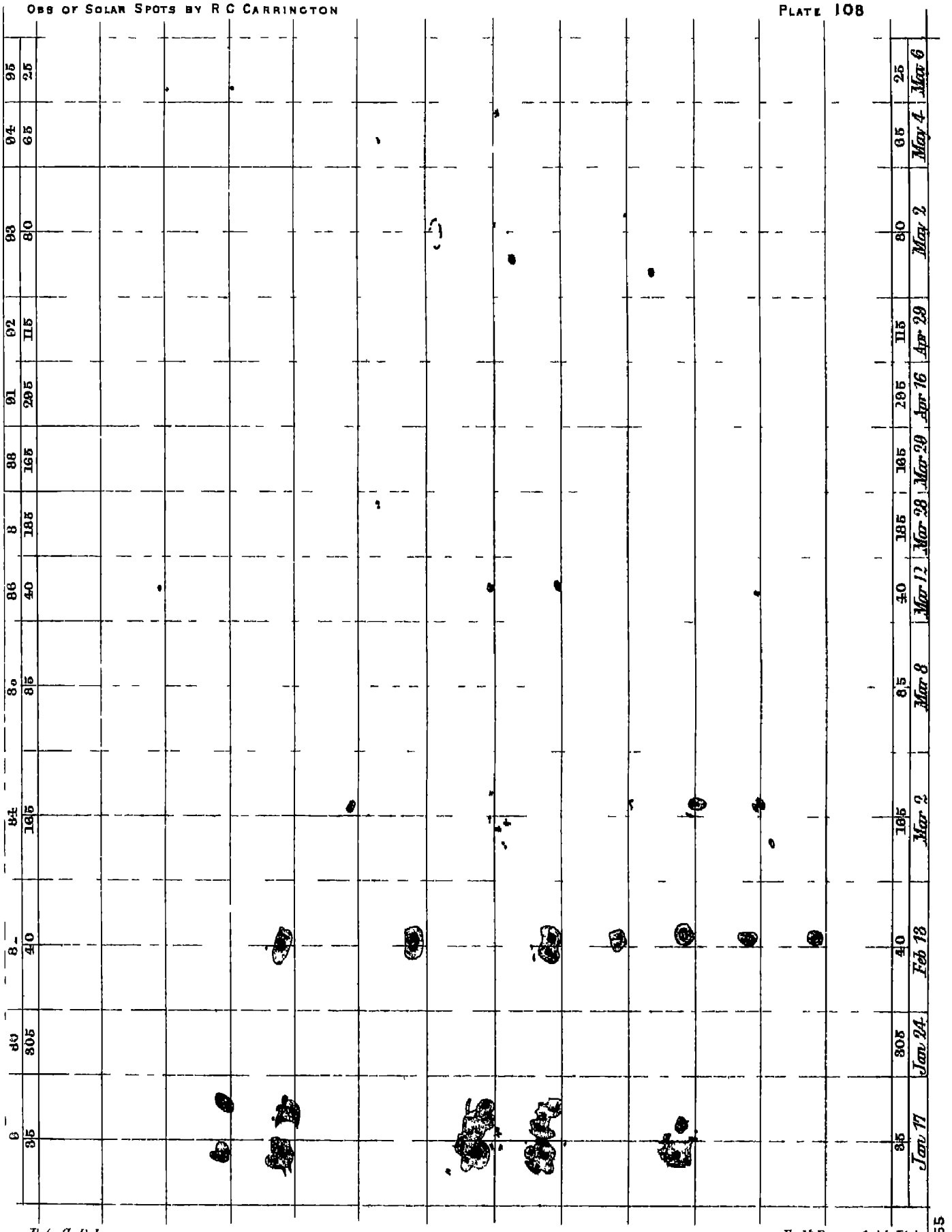
Fred Dangerfield Lith

1854


Obs of Solar Spots by R C Carrington
Plate 107
R C Dl
Fred.k Dangerfield Lith

Obs of Solar Spots by R C Carrington

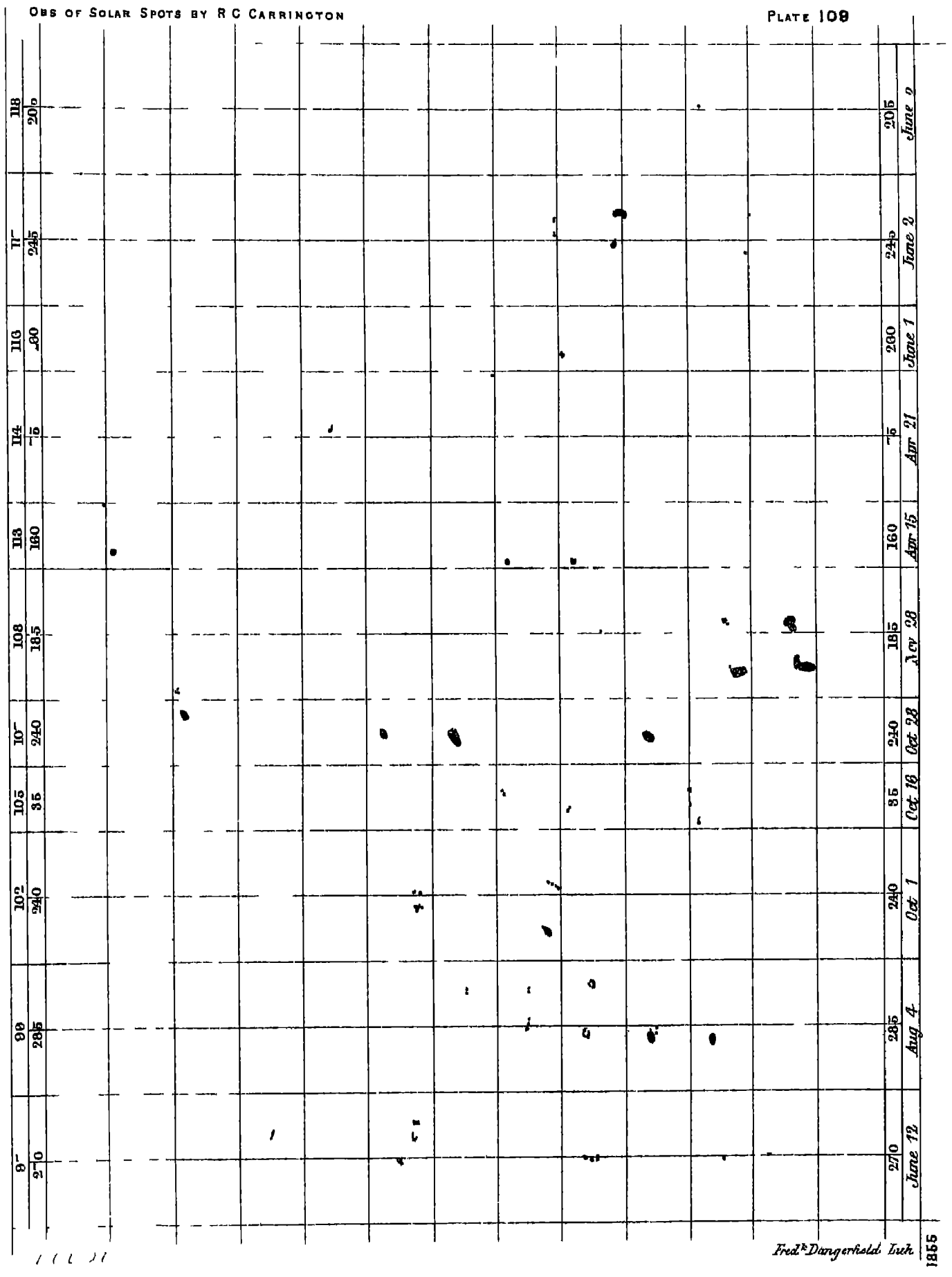
Plate 108

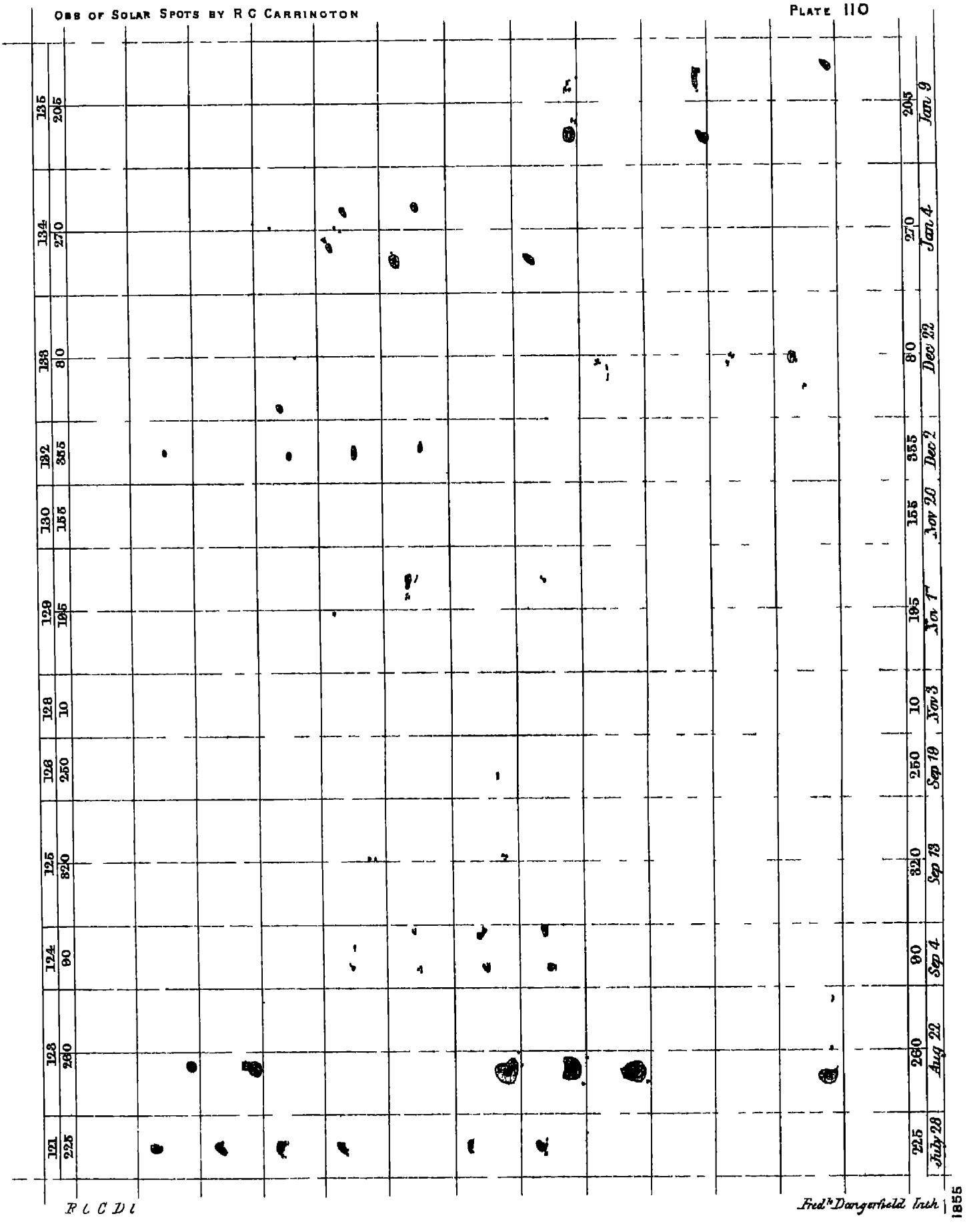


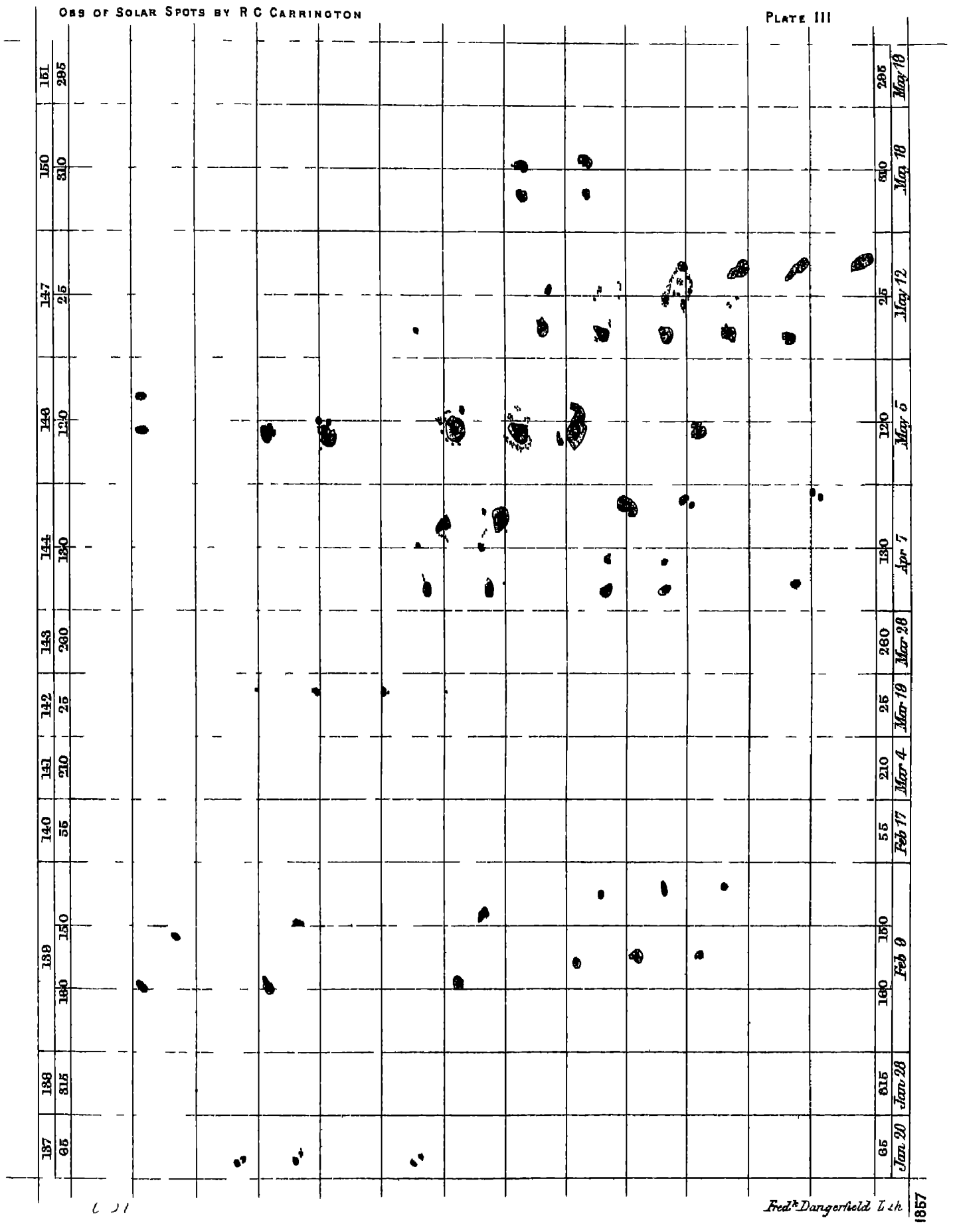
R C C Del

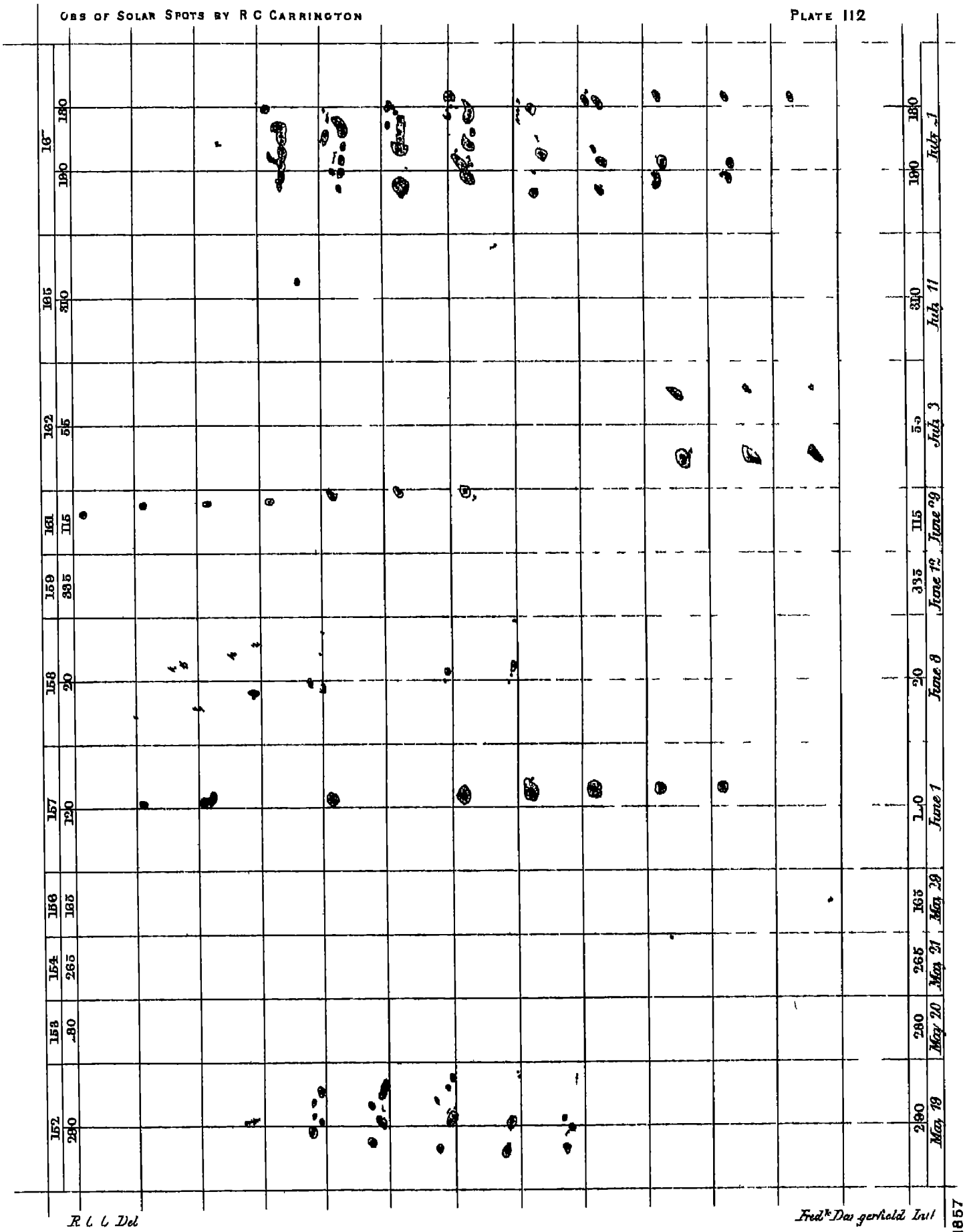
Fredk Dangerfield Lith

1855


Obs of Solar Spots by R C Carrington
Plate 108
June 9
June 2
June 1
Apr 21
Apr 15
Nov 28
Oct 28
Oct 16
Oct 1
Aug 4
June 12
Fred.k Dangerfield Lith.
1855


Obs of Solar Spots by R C Carrington
Plate 110
135 205
134 270
133 80
132 355
130 155
129 195
128 10
126 250
125 320
124 90
123 260
121 225
225 July 28
260 Aug 22
90 Sep 4
320 Sep 13
250 Sep 19
10 Nov 3
195 Nov 17
155 Nov 20
355 Dec 2
80 Dec 22
270 Jan 4
205 Jan 9
R C C Dl
Fred.k Dangerfield Lith.
1855


Obs of Solar Spots by R C Carrington
Plate III
151
295
150
310
147
25
146
120
144
180
143
280
142
25
141
210
140
55
139
150
180
138
815
137
65
295
May 18
310
May 18
25
May 12
120
May 5
180
Apr 7
280
Mar 28
25
Mar 19
210
Mar 4
55
Feb 17
150
180
Feb 9
815
Jan 28
65
Jan 20
Fredk Dangerfield Lith
1857



R C C Del

Fredk Dangerfield Lith

1857

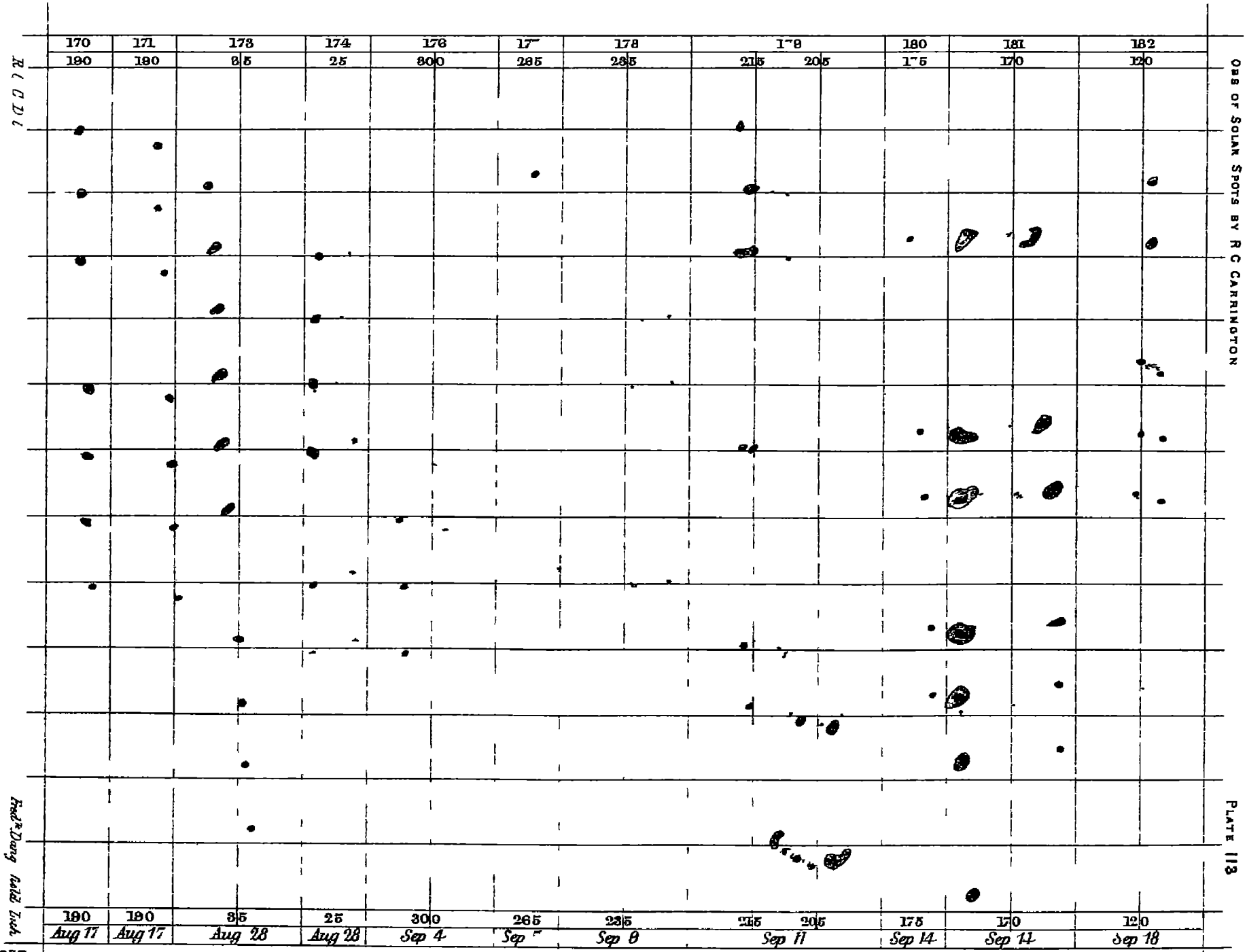
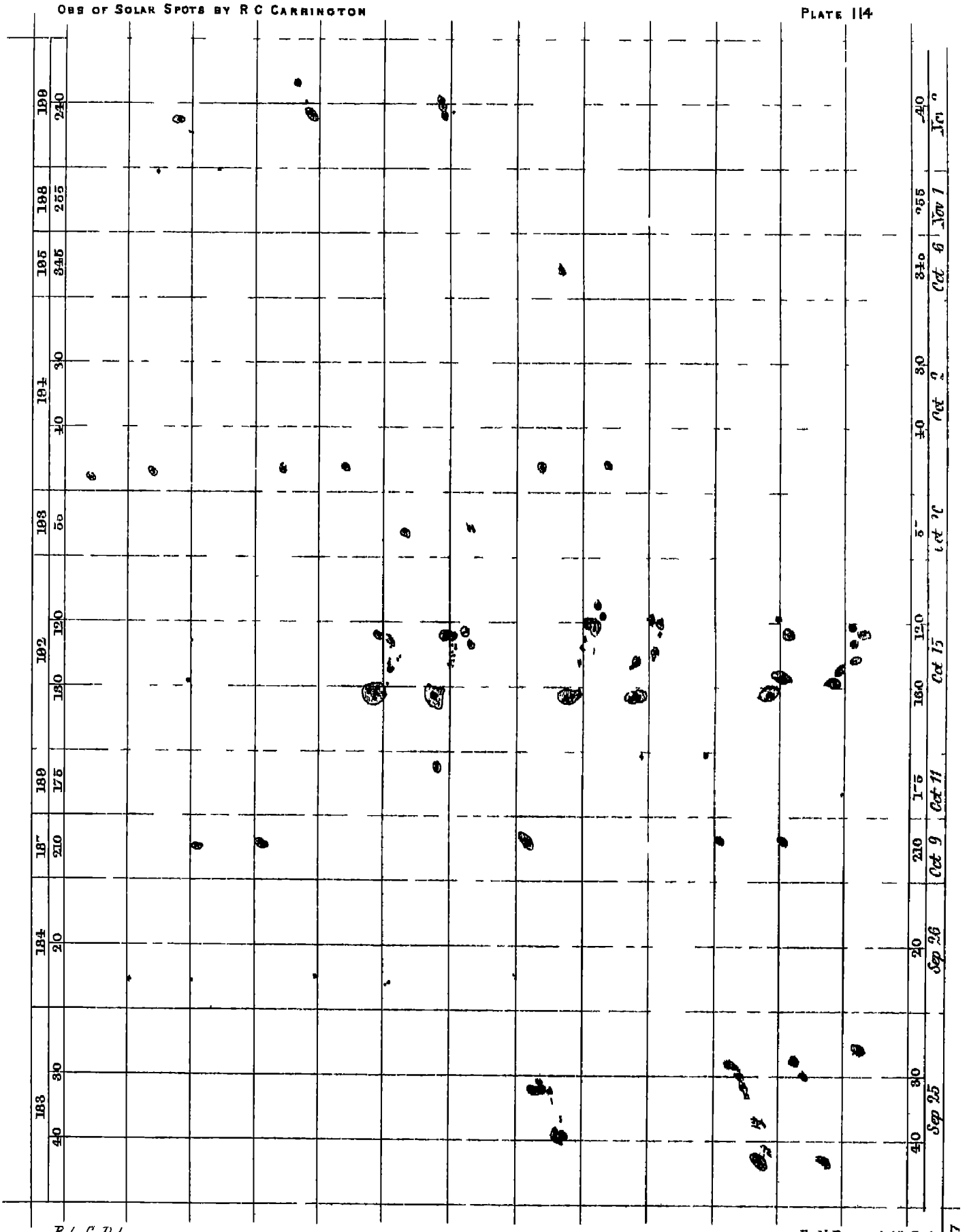


PLATE 113

1857

OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 114



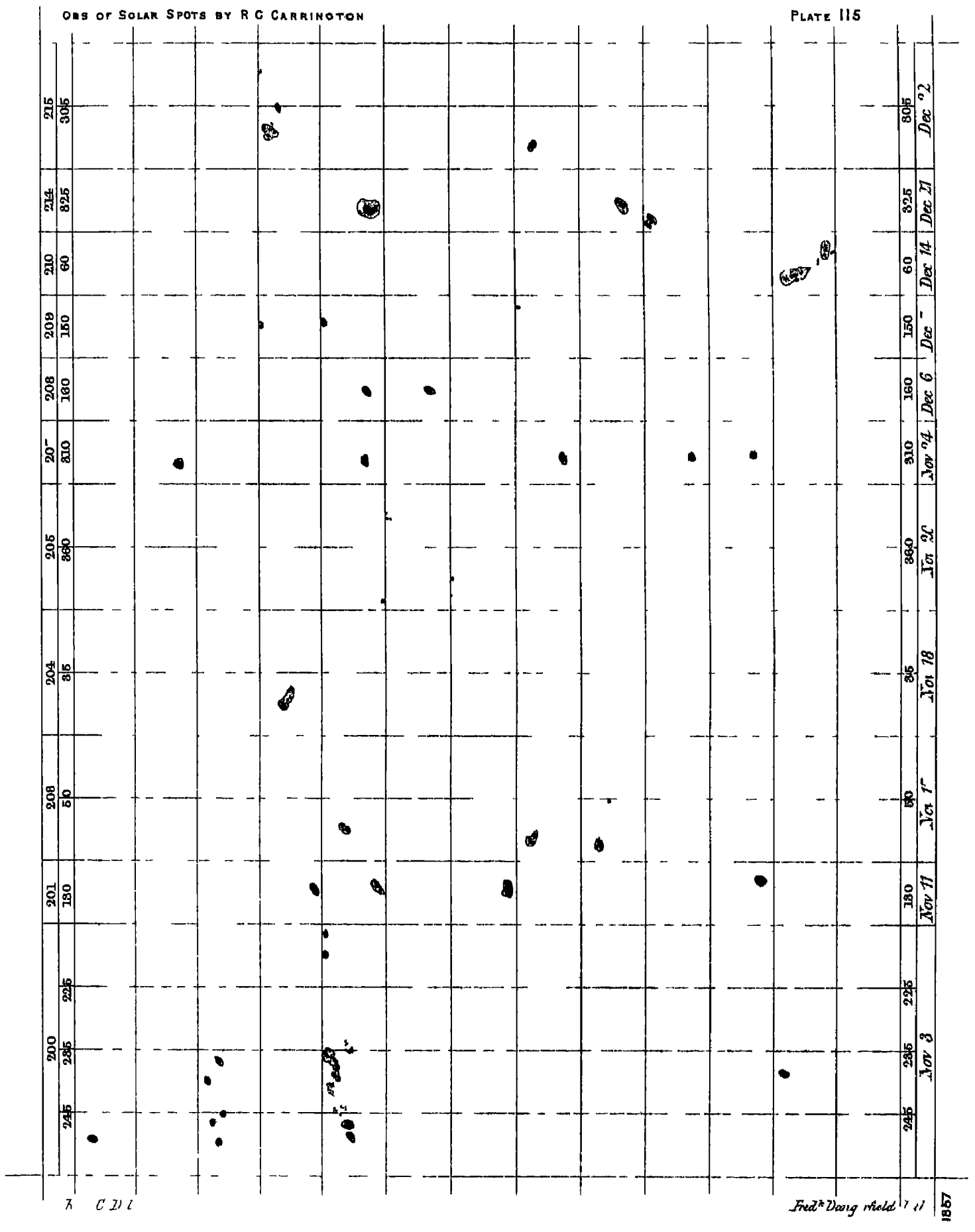
R C D l

Fredk Dangerfield Lith

1857

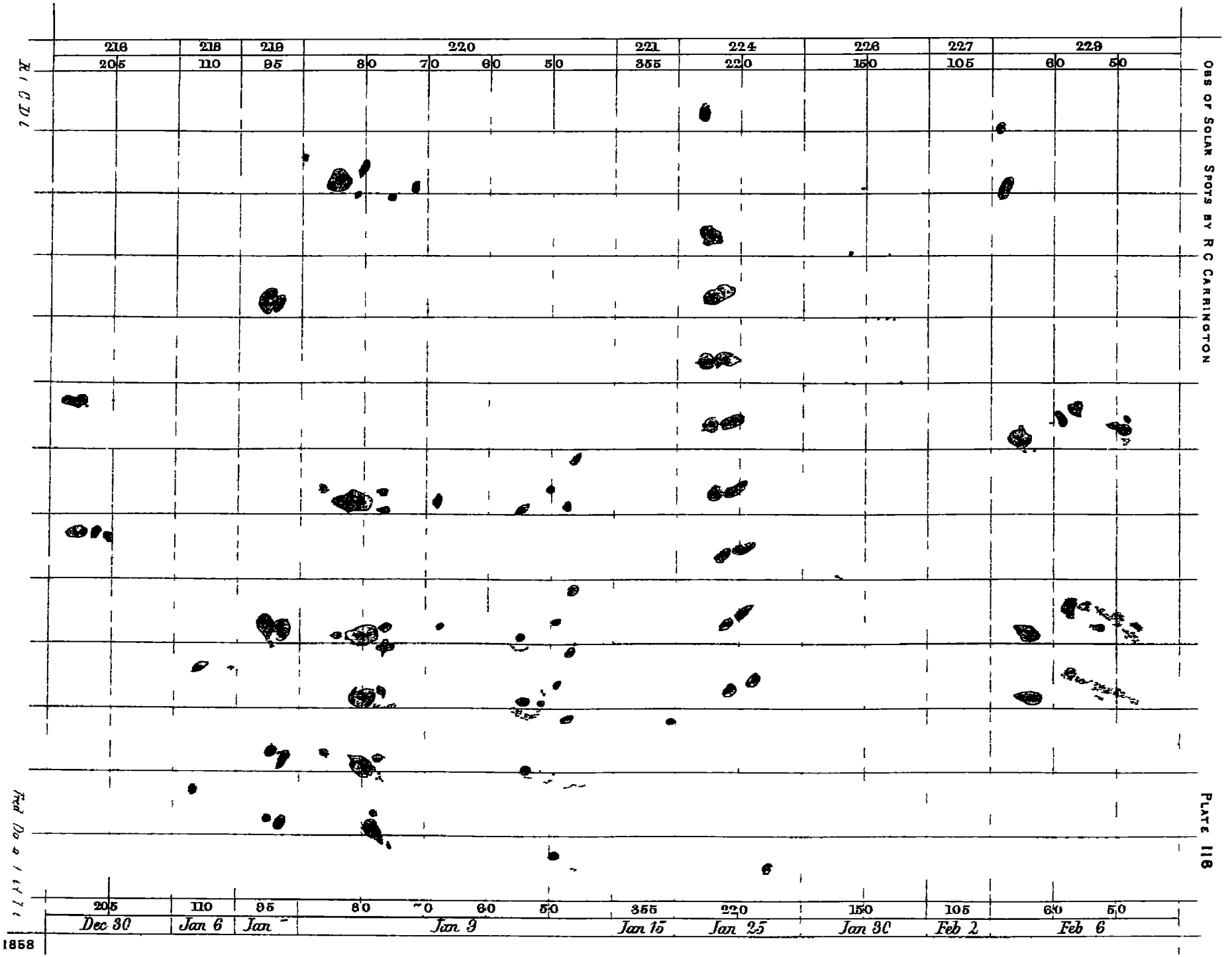
Obs of Solar Spots by R C Carrington

Plate 115



h C D l

Fredk Dangerfield 1857

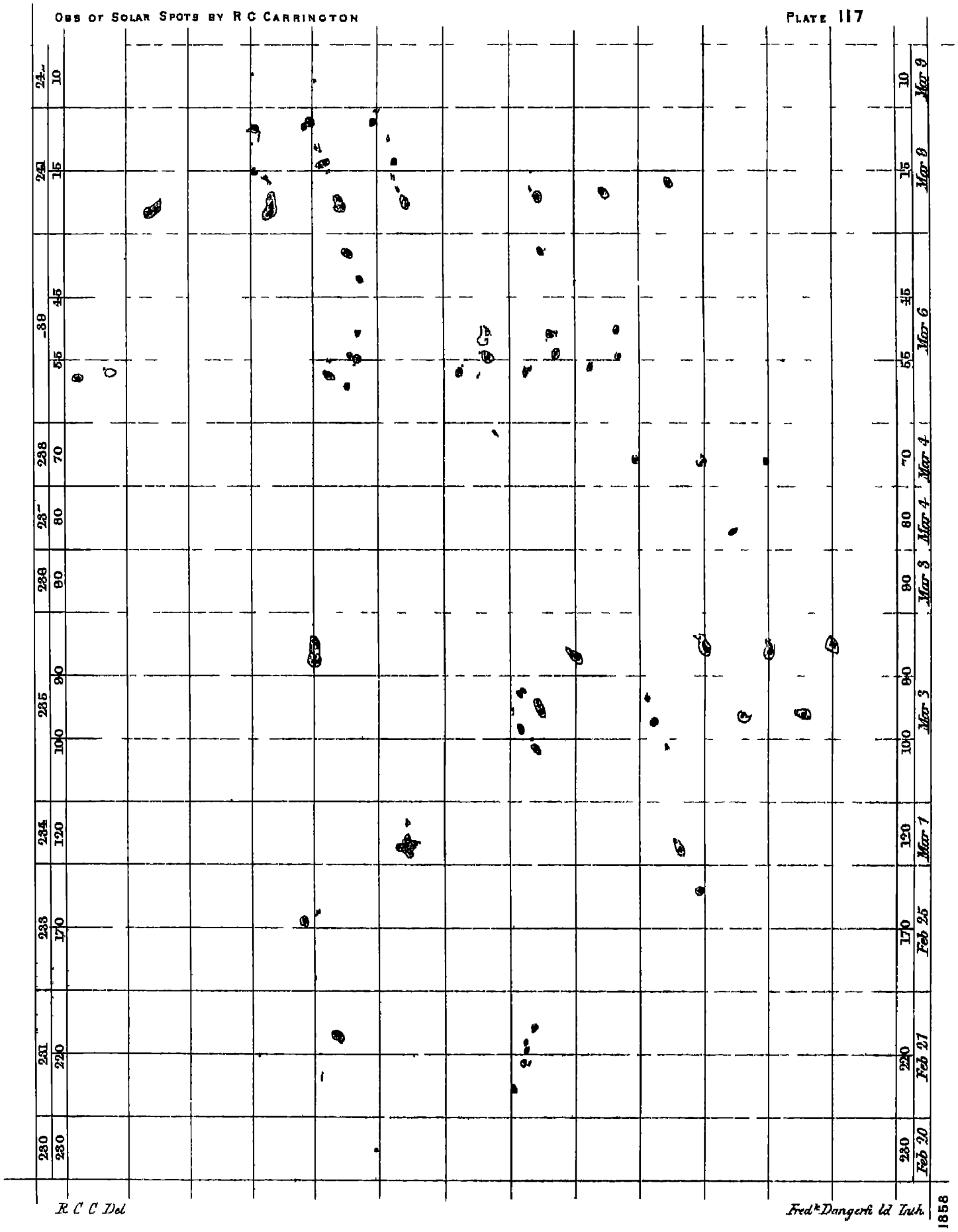


OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 118

Obs of Solar Spots by R C Carrington

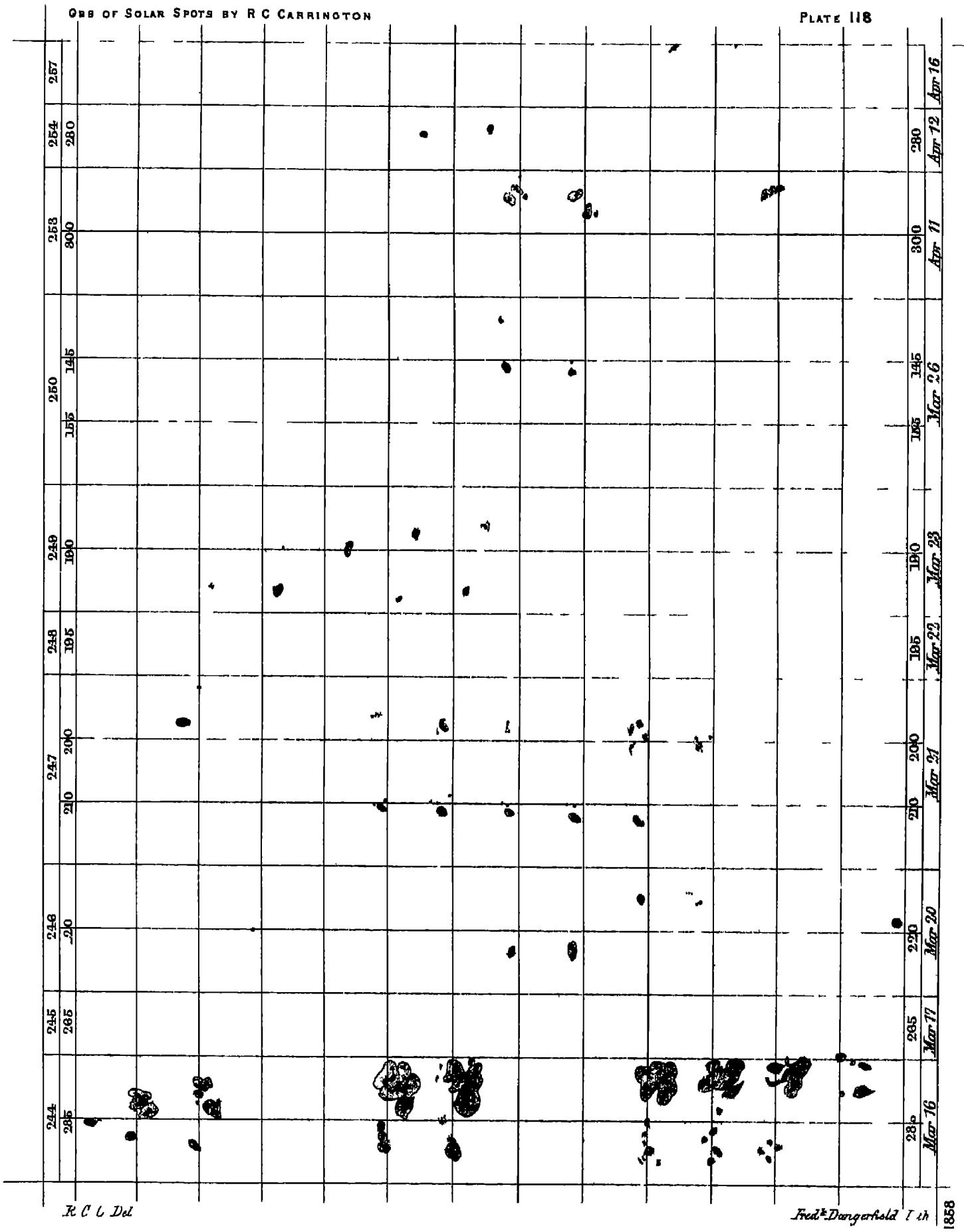
Plate 117



R C C Del

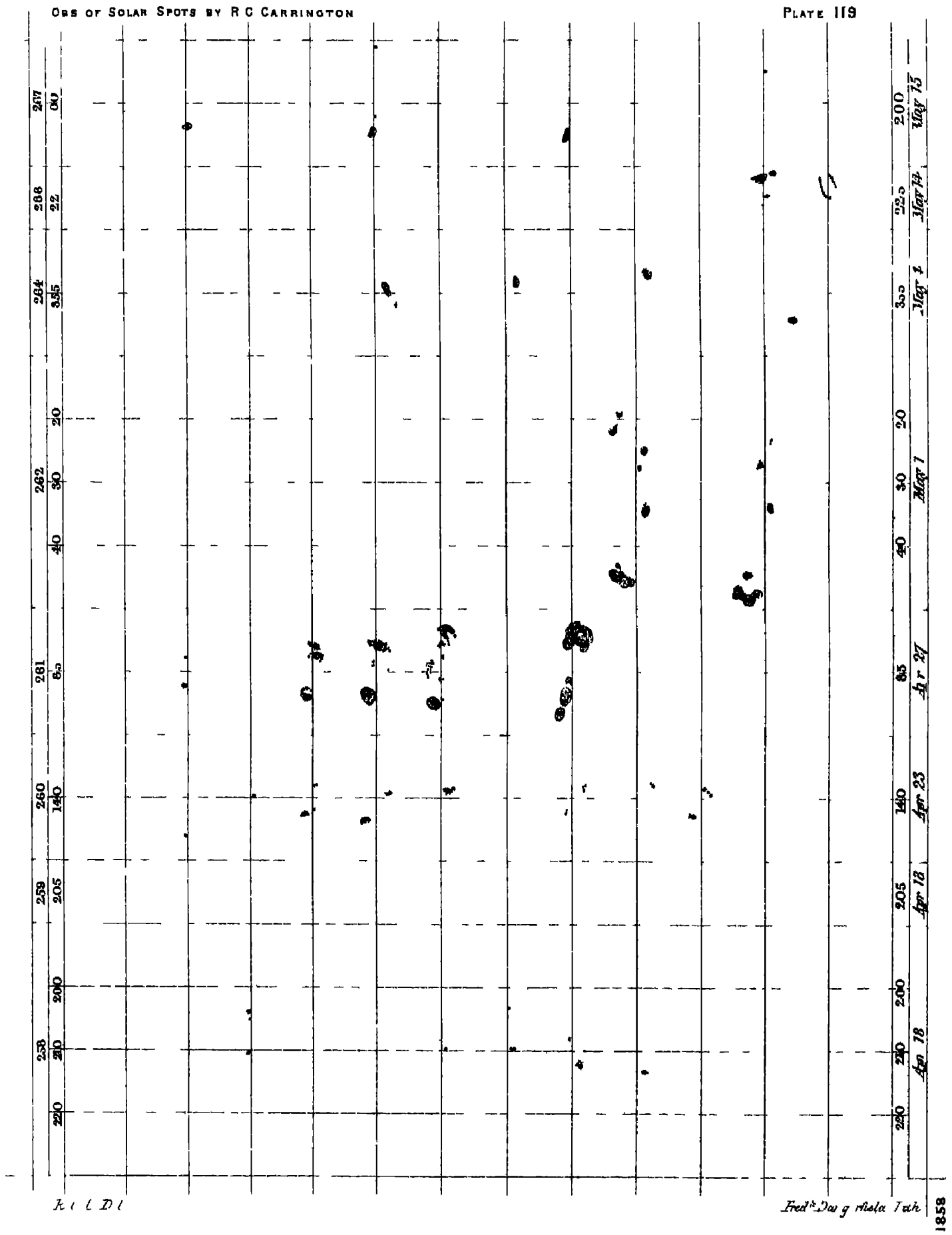
Fredk Dangerfield Lith.

1858


Obs of Solar Spots by R C Carrington
Plate 118
257
254 280
253 300
250 145 155
249 190
248 195
247 200 210
246 220
245 265
244 285
280 Apr 12
300 Apr 11
145 155 Mar 26
190 Mar 23
195 Mar 22
200 210 Mar 21
220 Mar 20
265 Mar 17
285 Mar 16
R C L Del
Fred.k Dangerfield Lith
1858

Obs of Solar Spots by R C Carrington

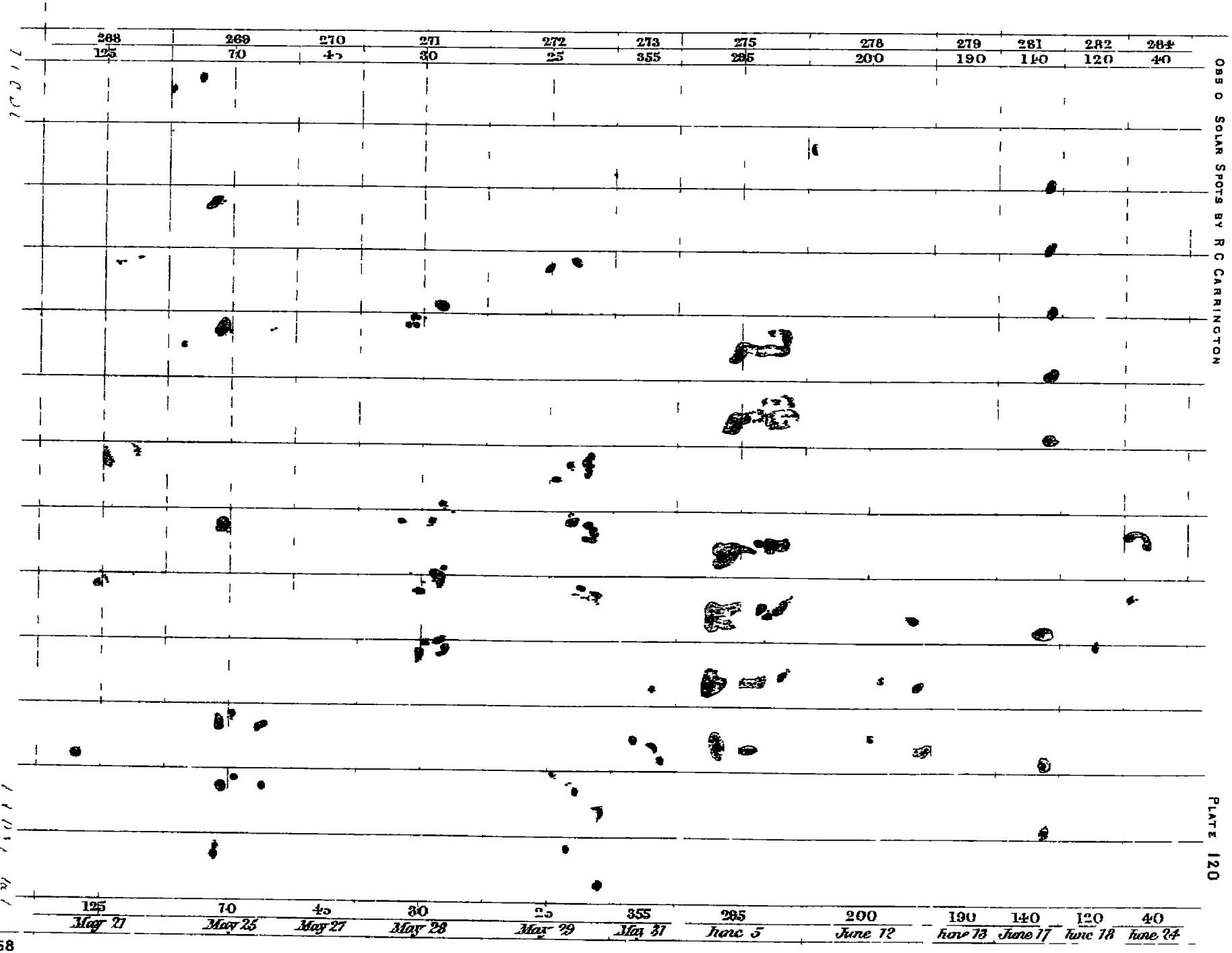
Plate 119



R C D l

Fredk Dangerfield Lith

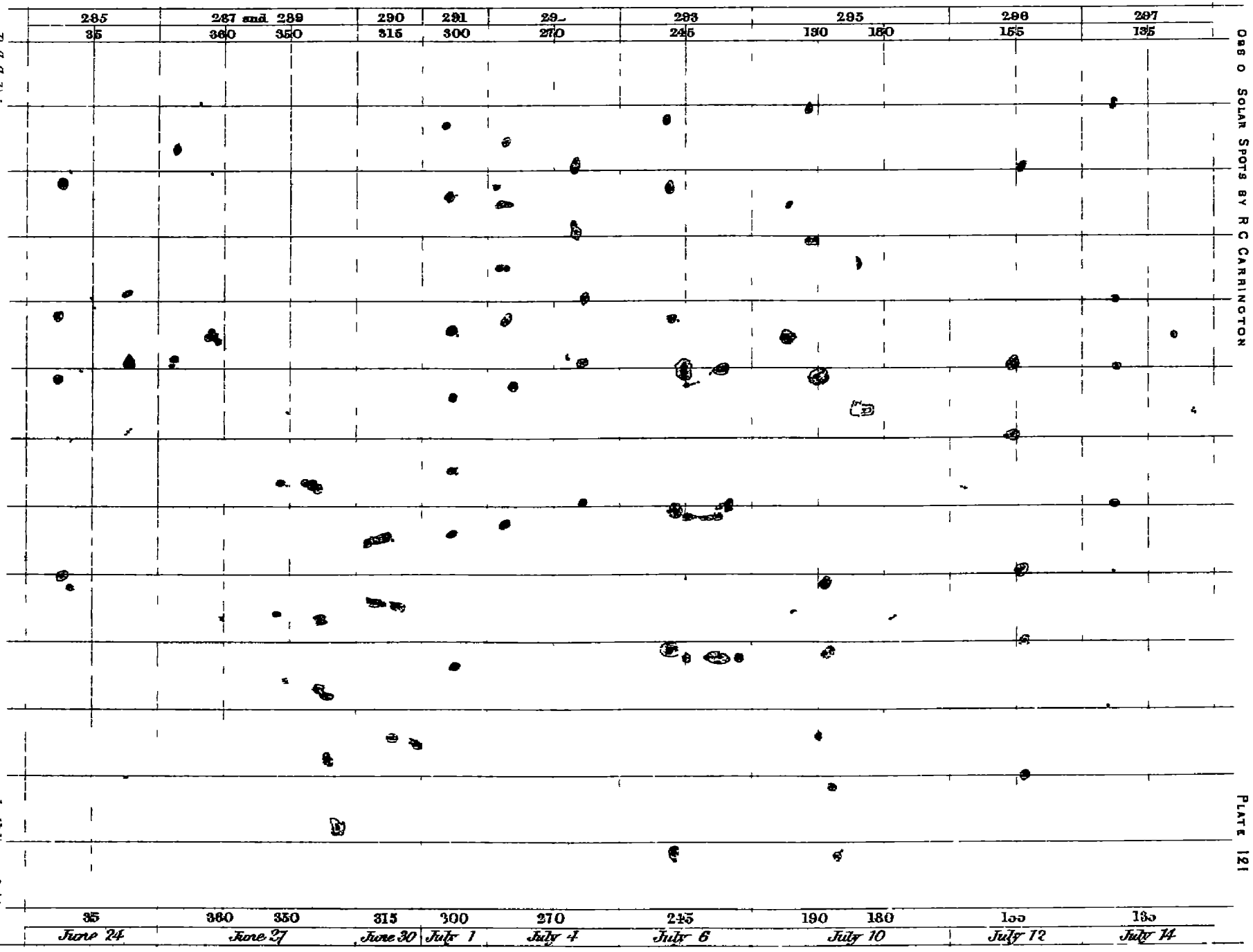
1858



OBS'D SOLAR SPOTS BY R C CARRINGTON

PLATE 120

1858

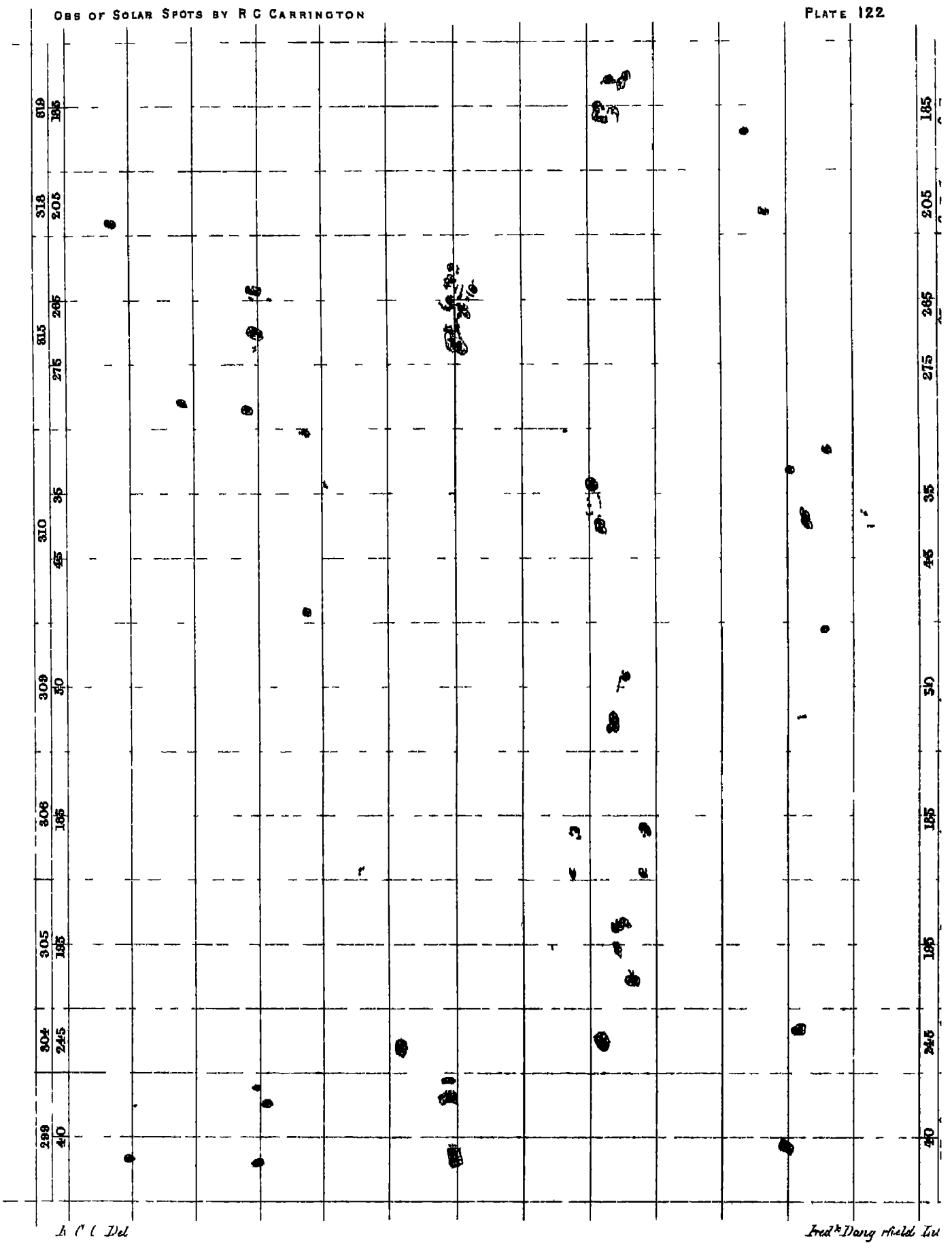


Obs o Solar Spots by R C Carrington

Plate 121

Obs of Solar Spots by R C Carrington

Plate 122

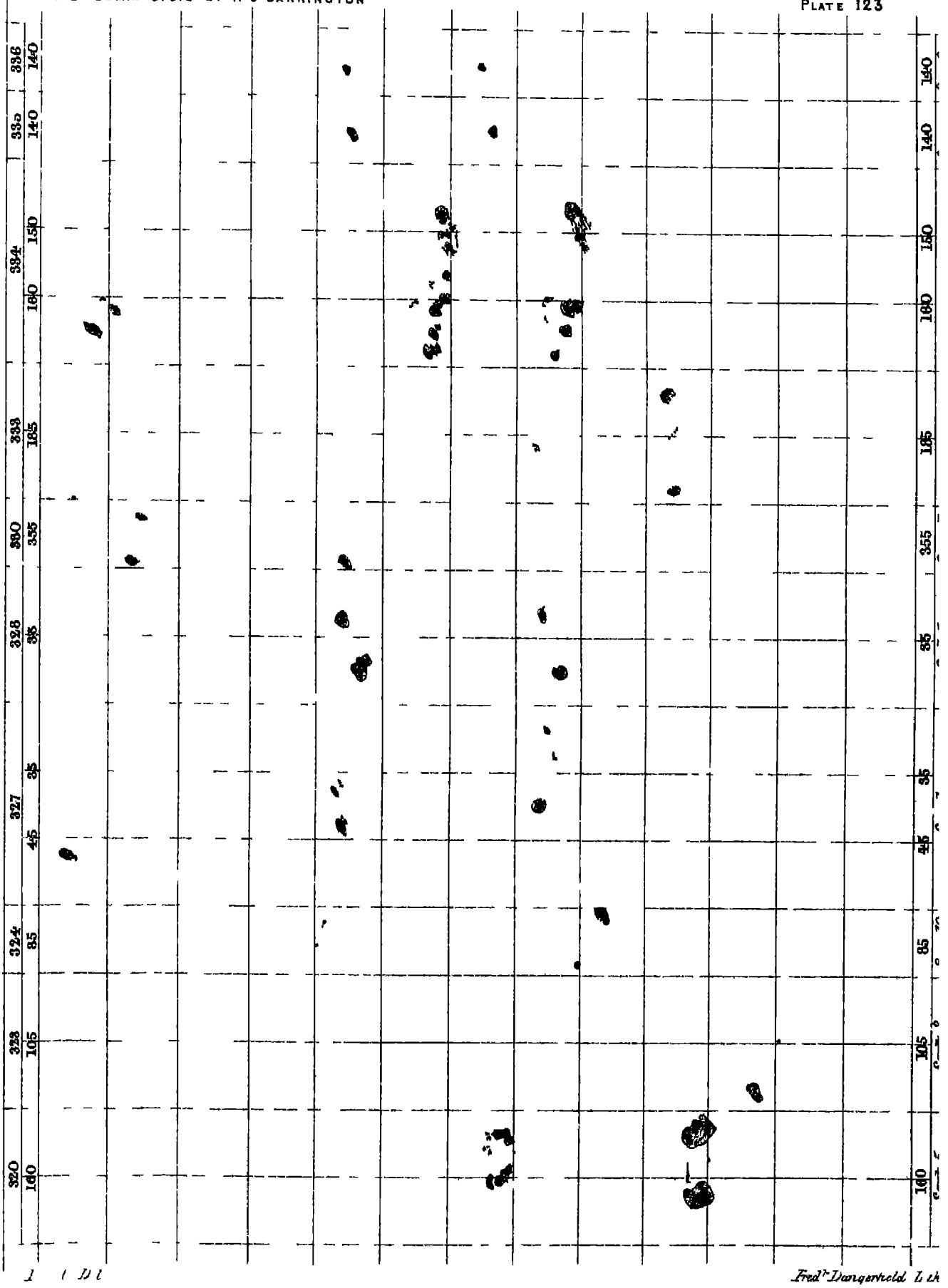


R C C Del

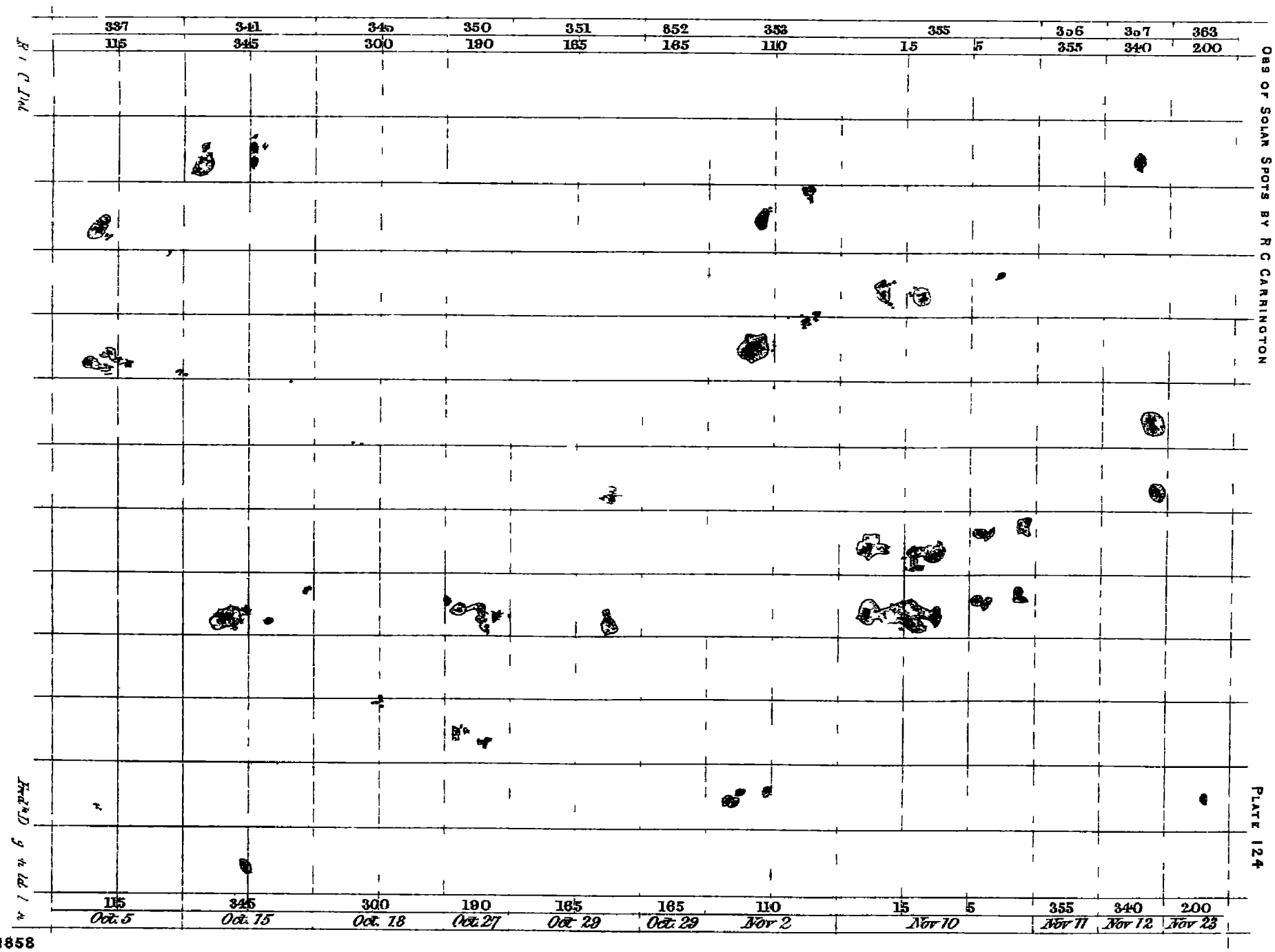
Fredk Dangerfield Lit

Obs o Solar Spots by R C Carrington

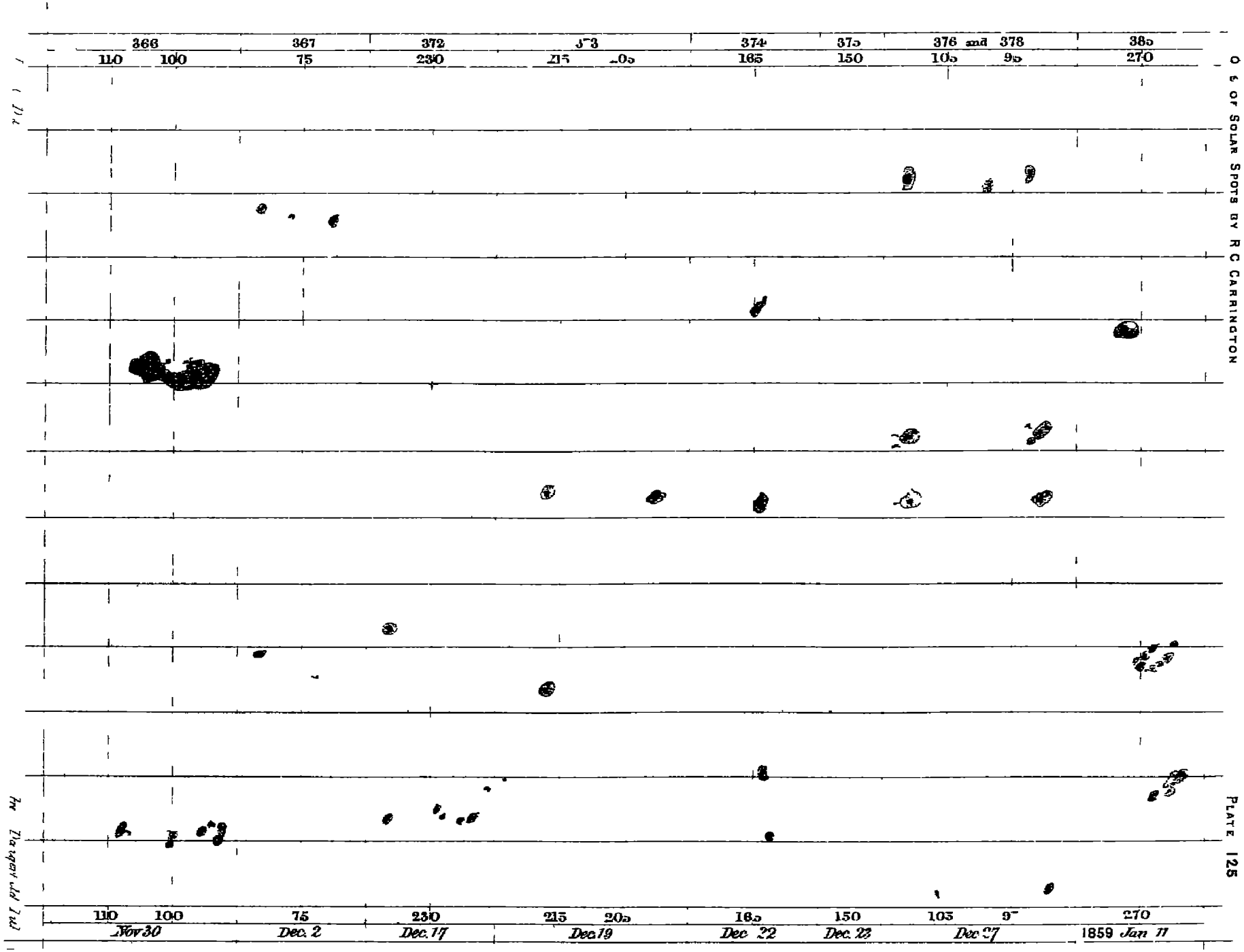
Plate 123



Fredk Dangerfield Lith

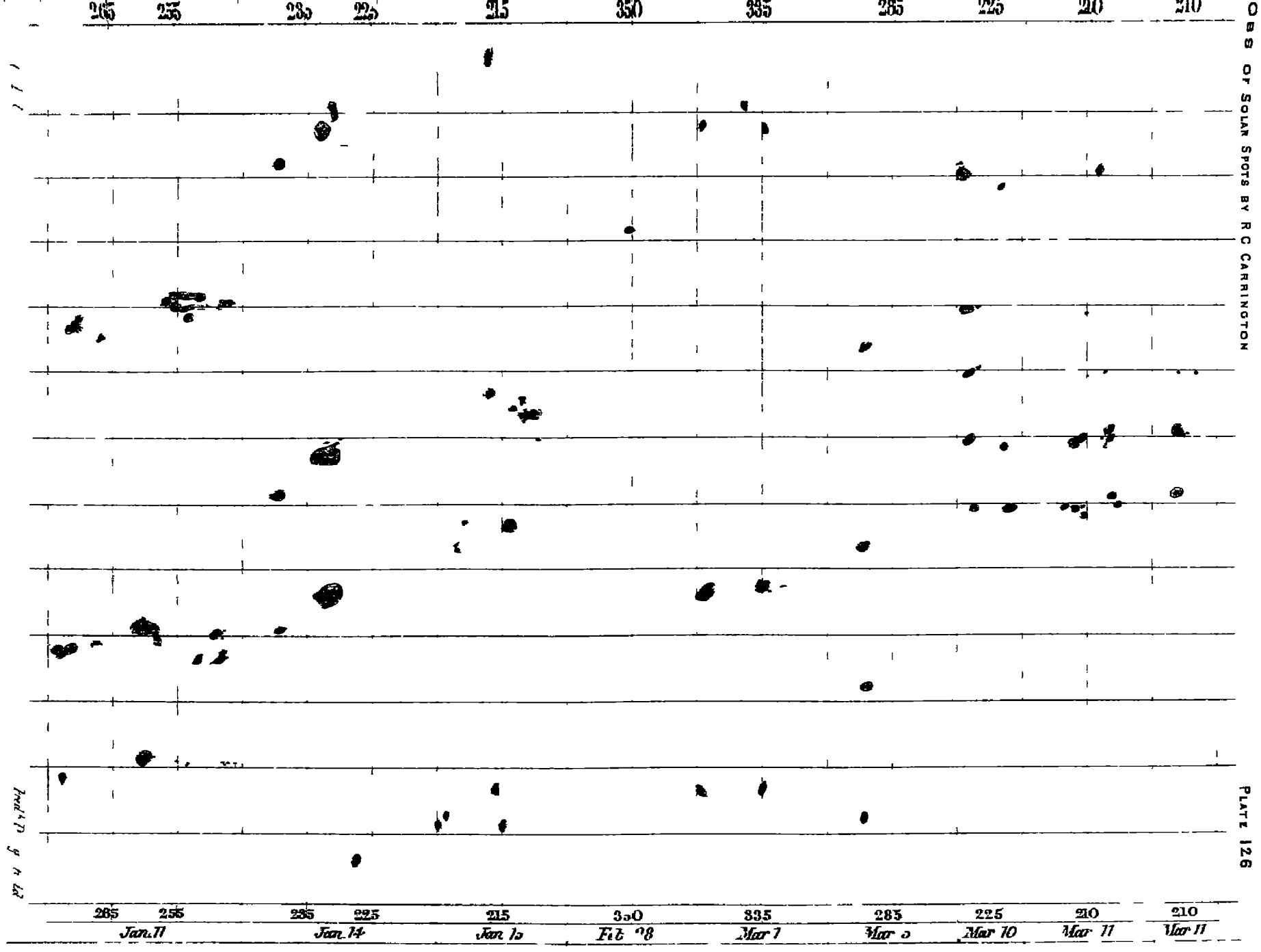

337 341 345 350 351 352 353 355 356 357 363
115 345 300 190 165 165 110 15 5 355 340 200
Obs of Solar Spots by R C Carrington
Plate 124
115 345 300 190 165 165 110 15 5 355 340 200
Oct. 5 Oct. 15 Oct. 18 Oct. 27 Oct. 29 Oct. 29 Nov 2 Nov 10 Nov 11 Nov 12 Nov 23

1858



O. S. OF SOLAR SPOTS BY R. C. CARRINGTON

PLATE 125



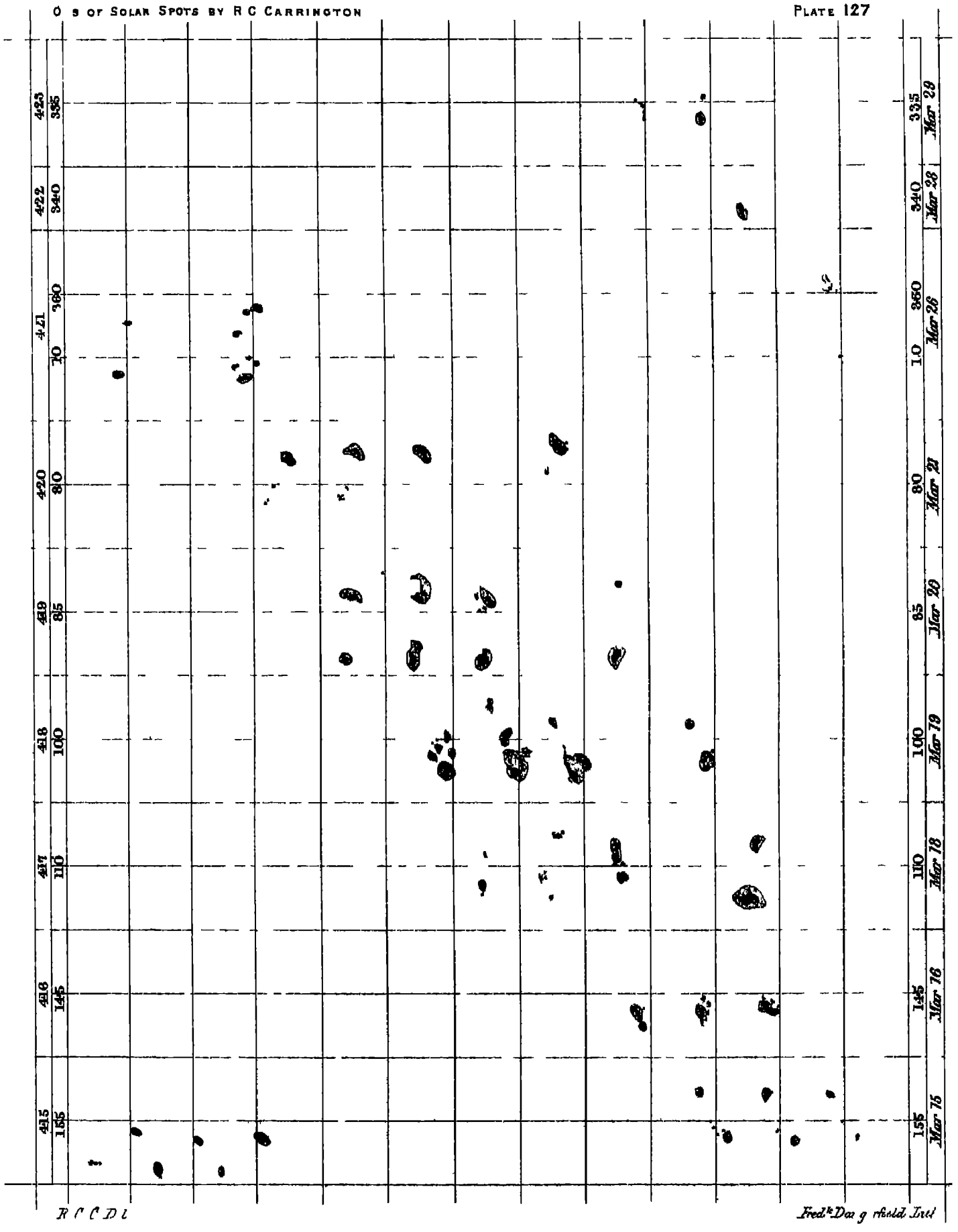
OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 126

1859

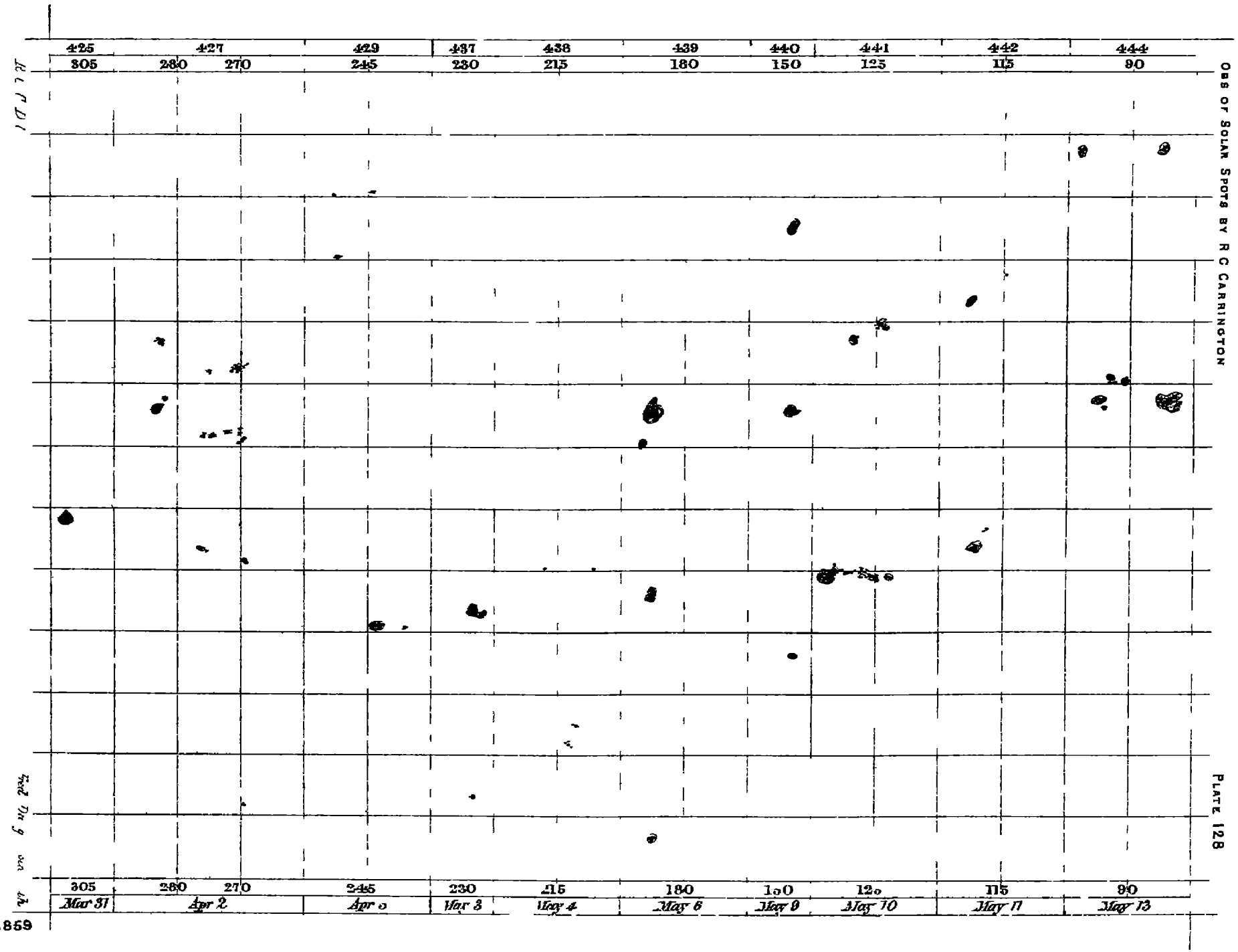
O s of Solar Spots by R C Carrington

Plate 127



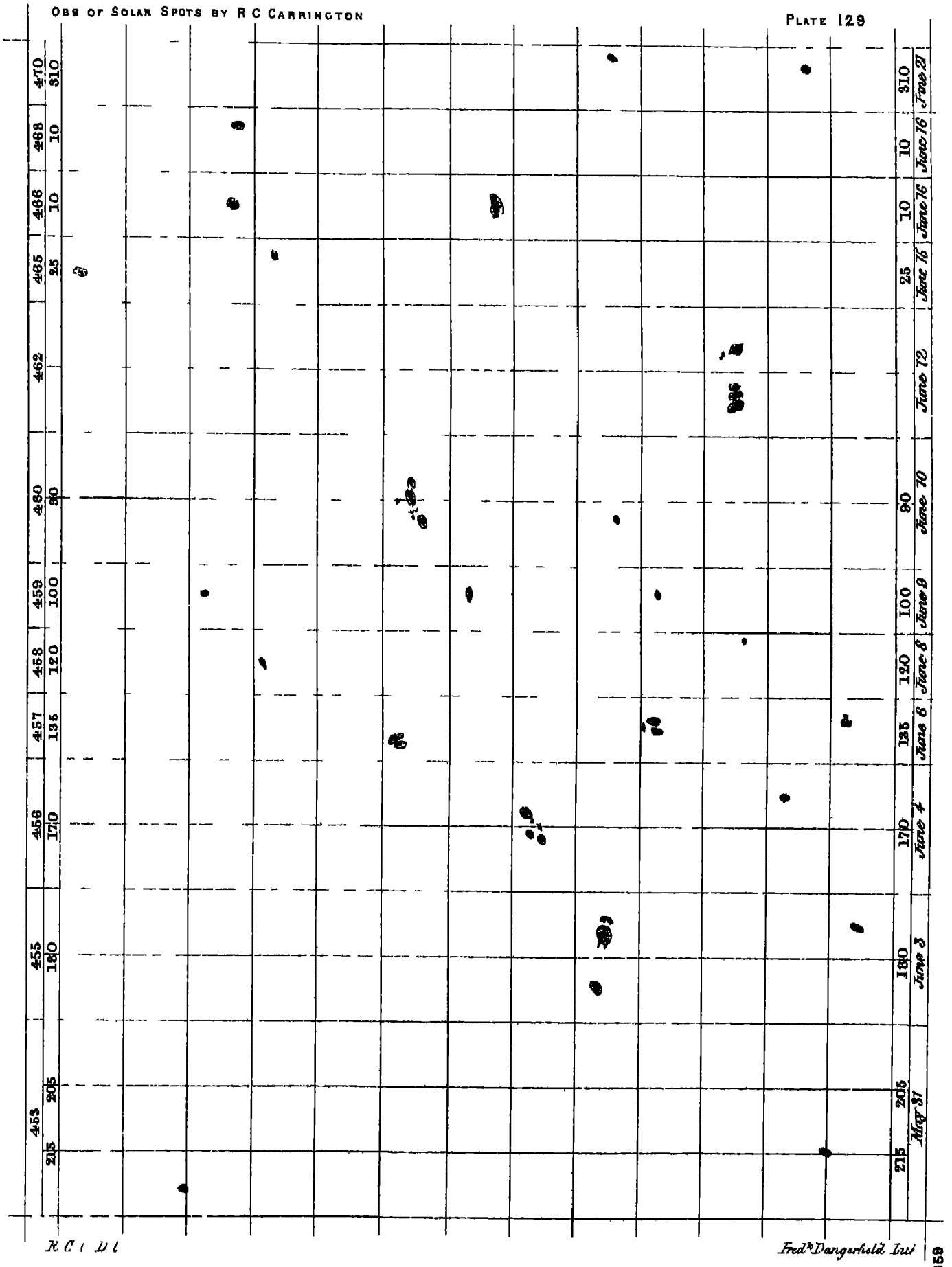
R C C D l

Fredk Dangerfield Lith


425 427 429 437 438 439 440 441 442 444
305 280 270 245 230 215 180 150 125 115 90
305 280 270 245 230 215 180 150 120 115 90
Mar 31 Apr 2 Apr 9 Mar 3 May 4 May 6 May 9 May 10 May 11 May 13
1859
OBS OF SOLAR SPOTS BY R C CARRINGTON
PLATE 128

OBS OF SOLAR SPOTS BY R C CARRINGTON

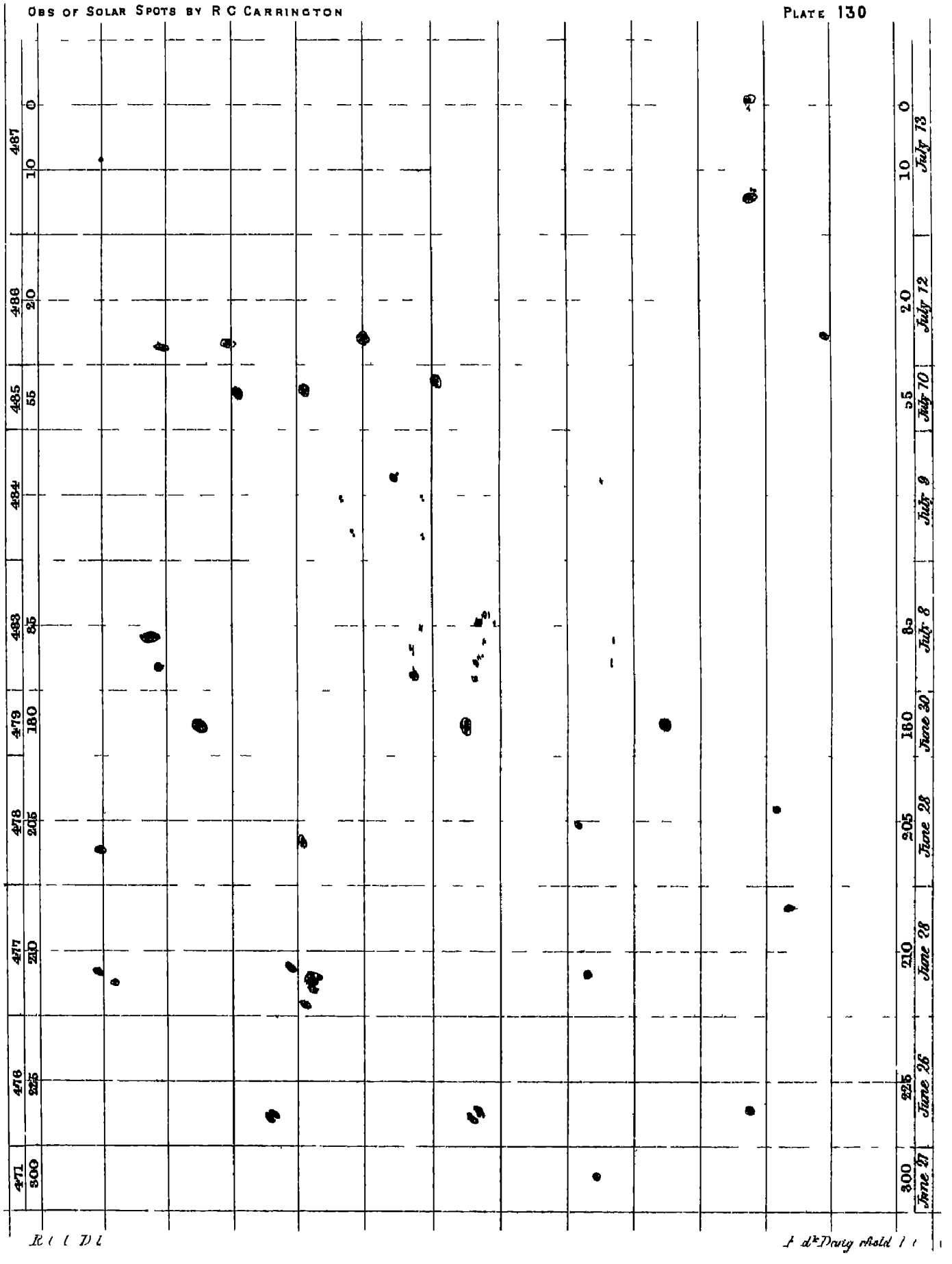
PLATE 129

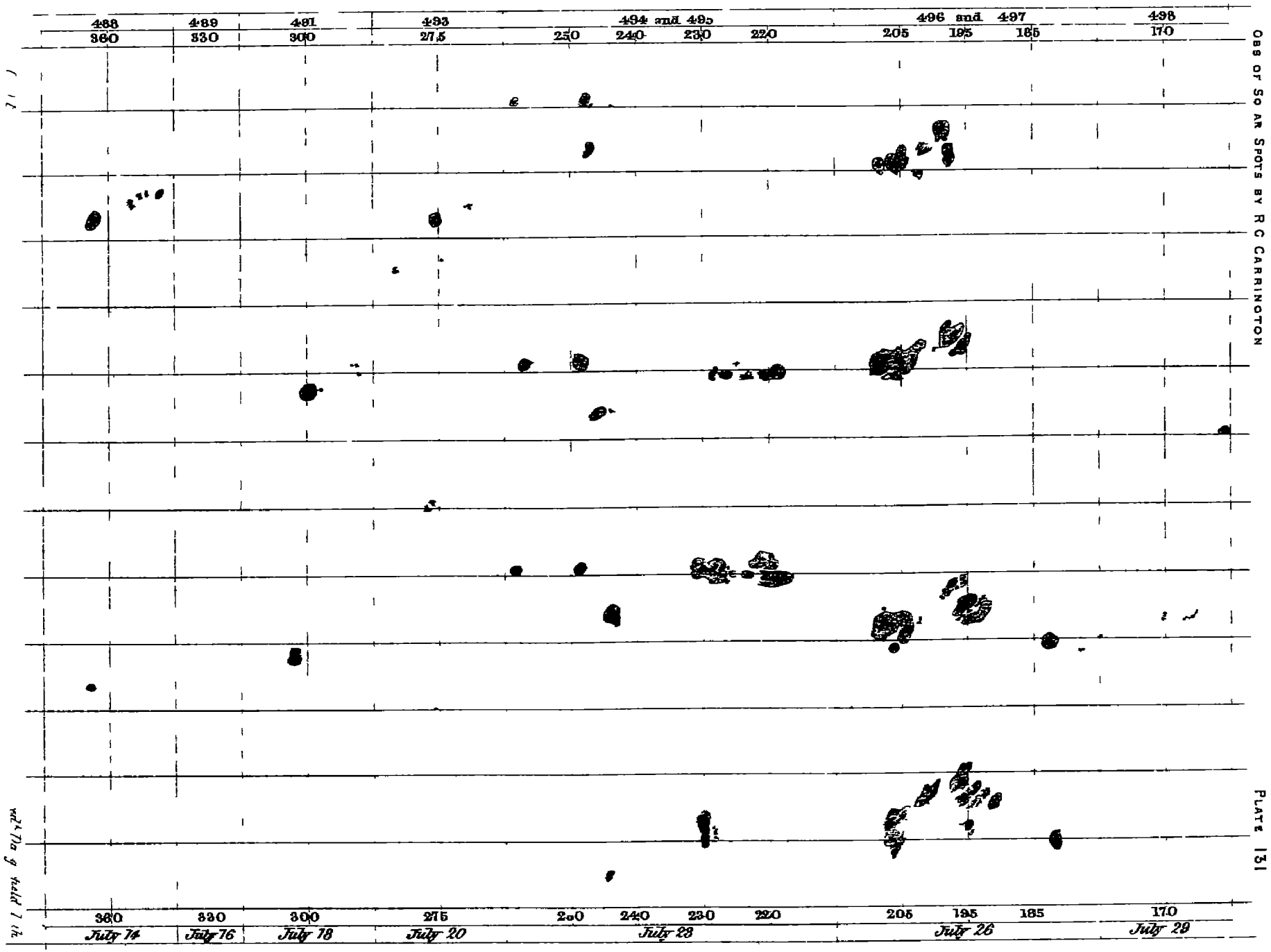


R C C D L

Fredk Dangerfield Lith

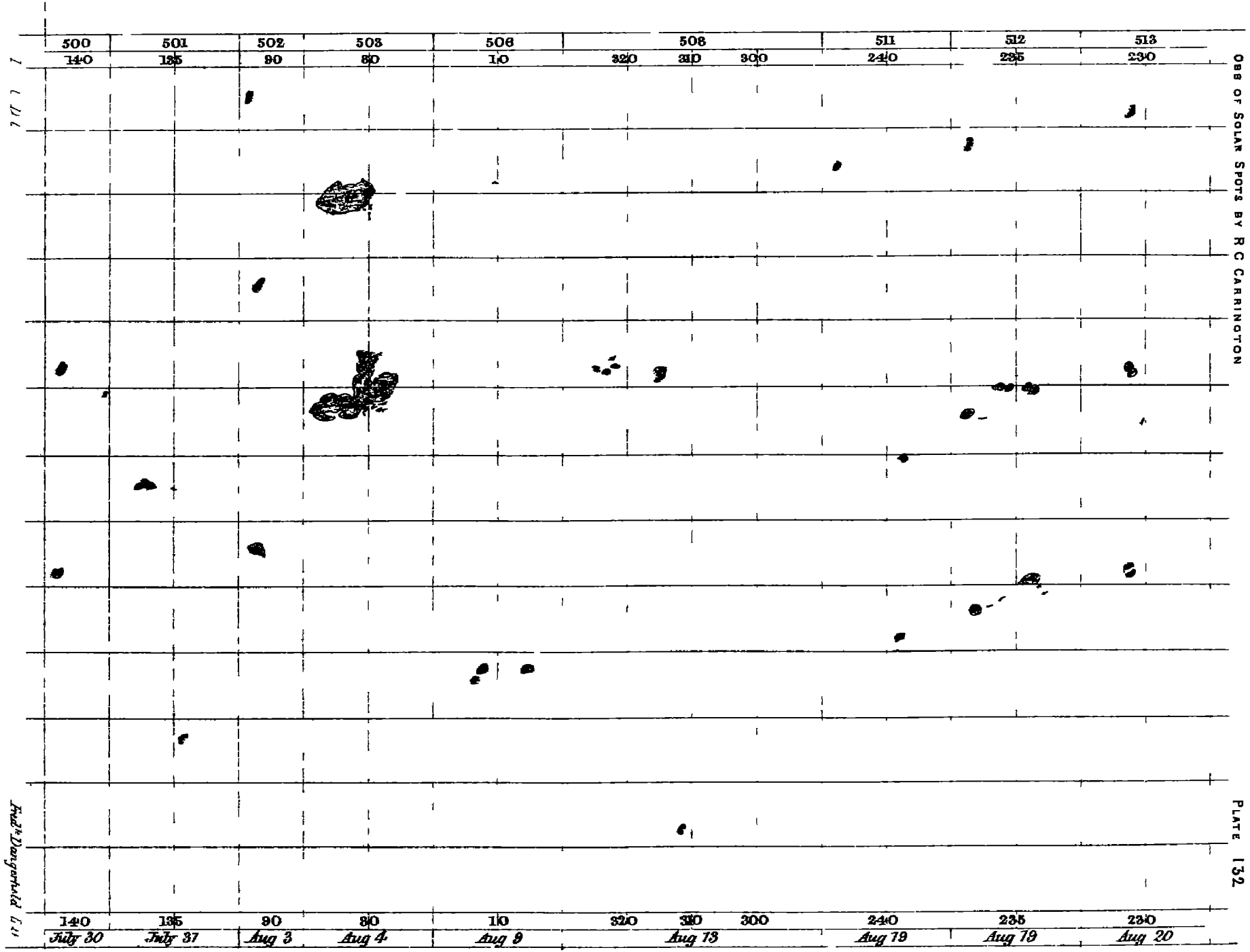
1859


Obs of Solar Spots by R C Carrington
Plate 130
471
476
477
478
479
483
484
485
486
487
300
225
210
205
180
85
55
20
10
0
June 27
June 26
June 28
June 28
June 30
July 8
July 9
July 10
July 12
July 13



OBS OF SO AR SPOTS BY R C CARRINGTON

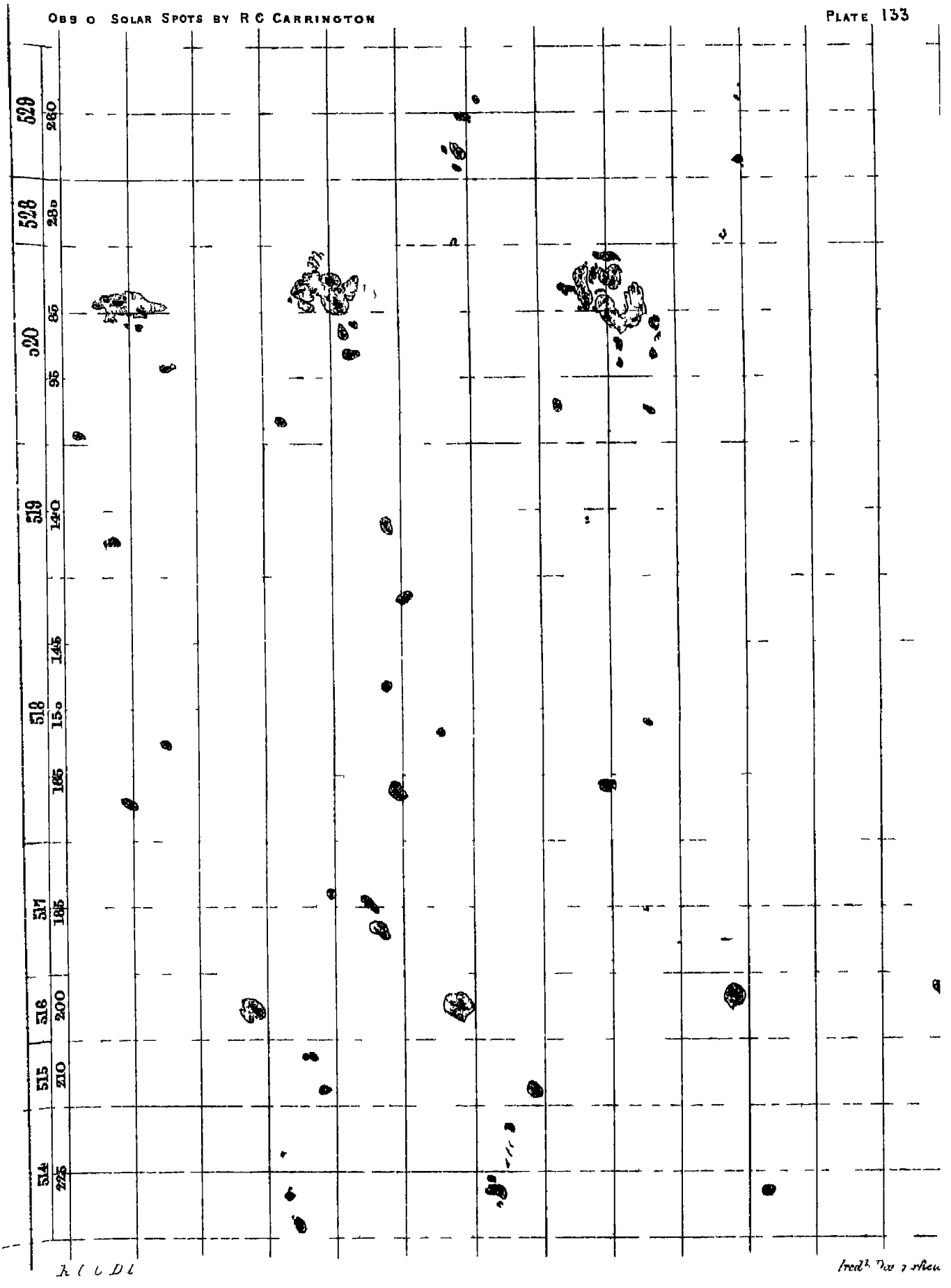
PLATE 131



OBS OF SOLAR SPOTS BY R C CARRINGTON

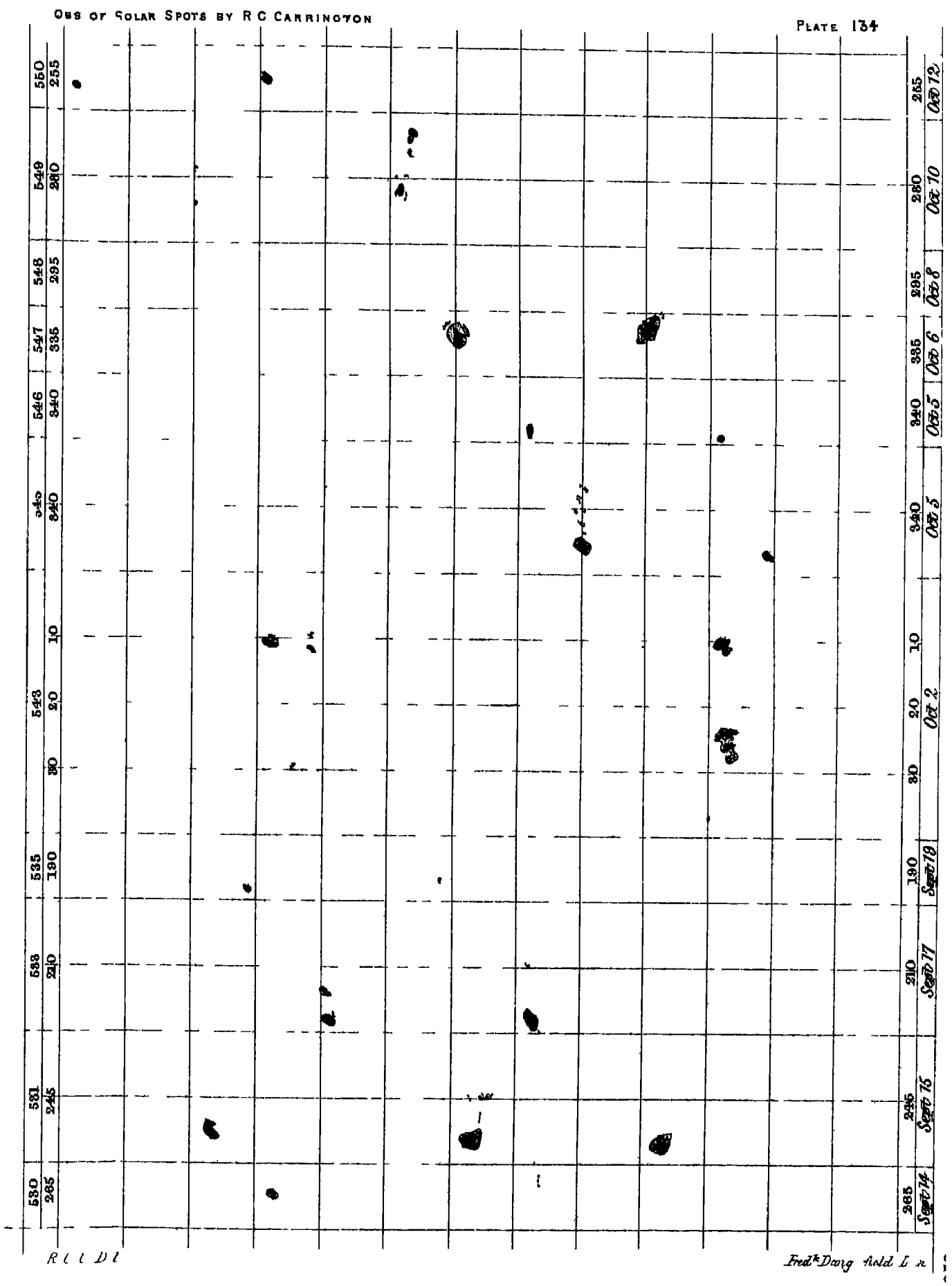
PLATE 132

1859


OBS O SOLAR SPOTS BY R C CARRINGTON
529
260
528
280
520
85
95
519
140
145
518
150
165
517
185
516
200
515
210
514
225

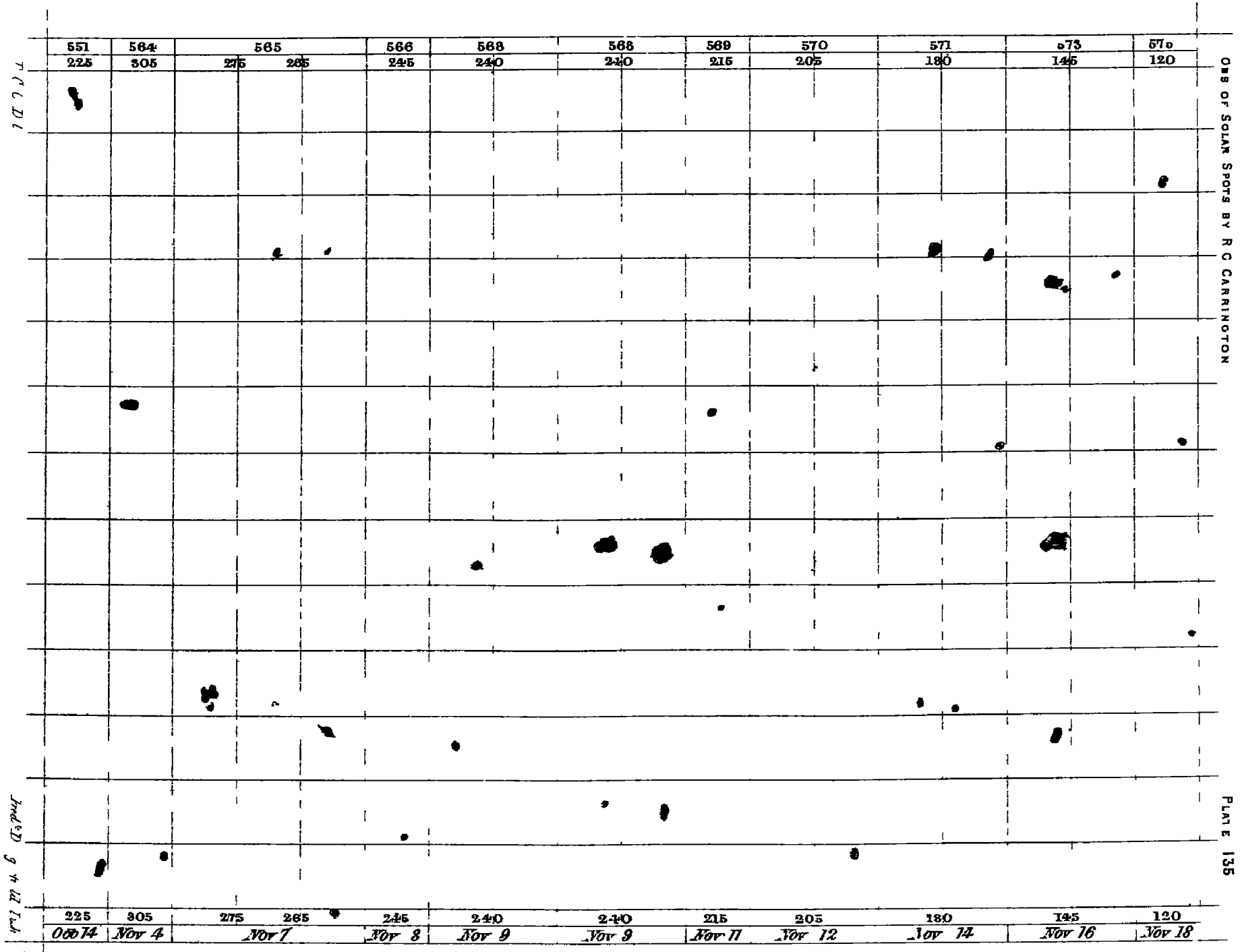
Obs of Solar Spots by R C Carrington

Plate 134

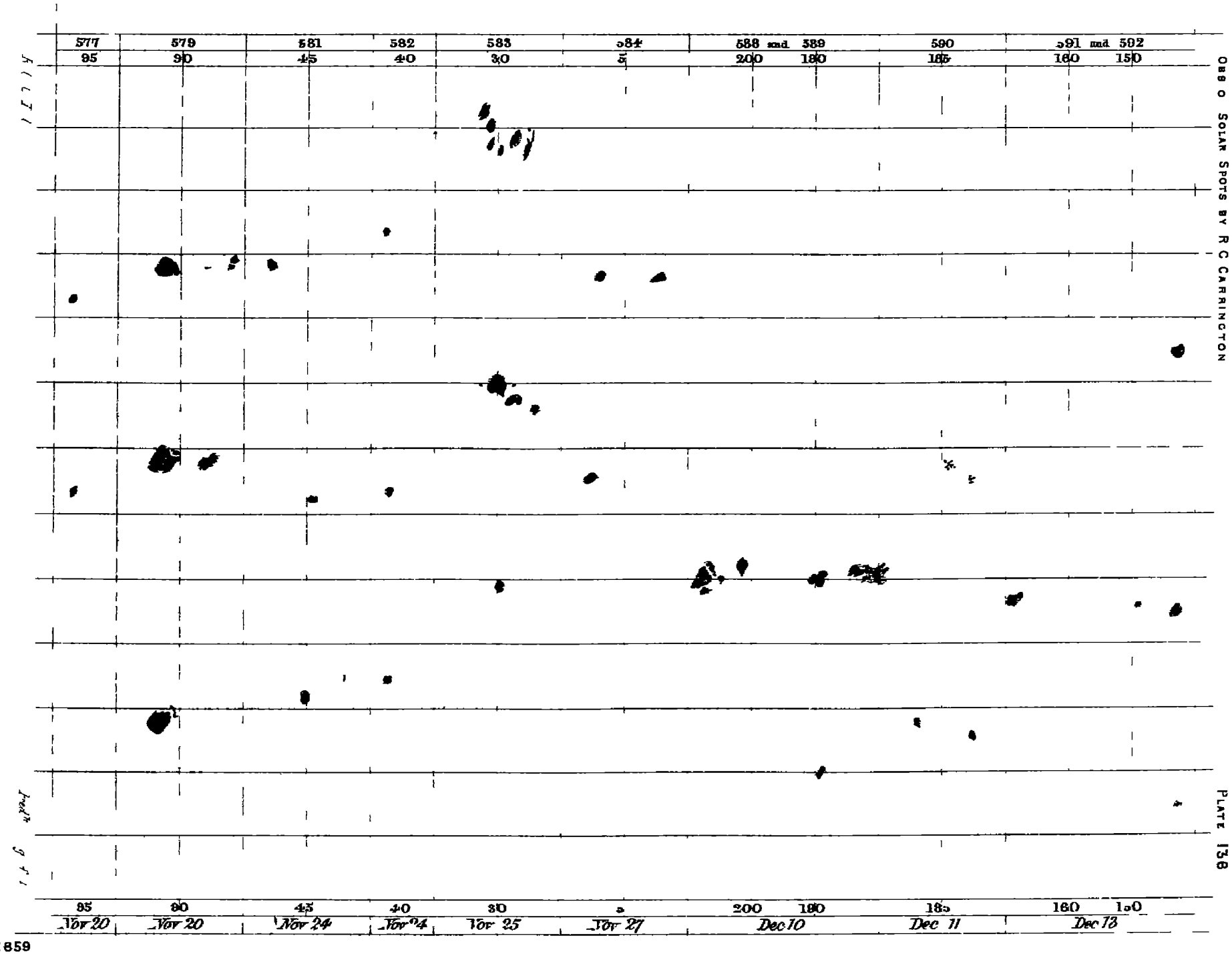


R C C D l

Fredk Dang Hold L n

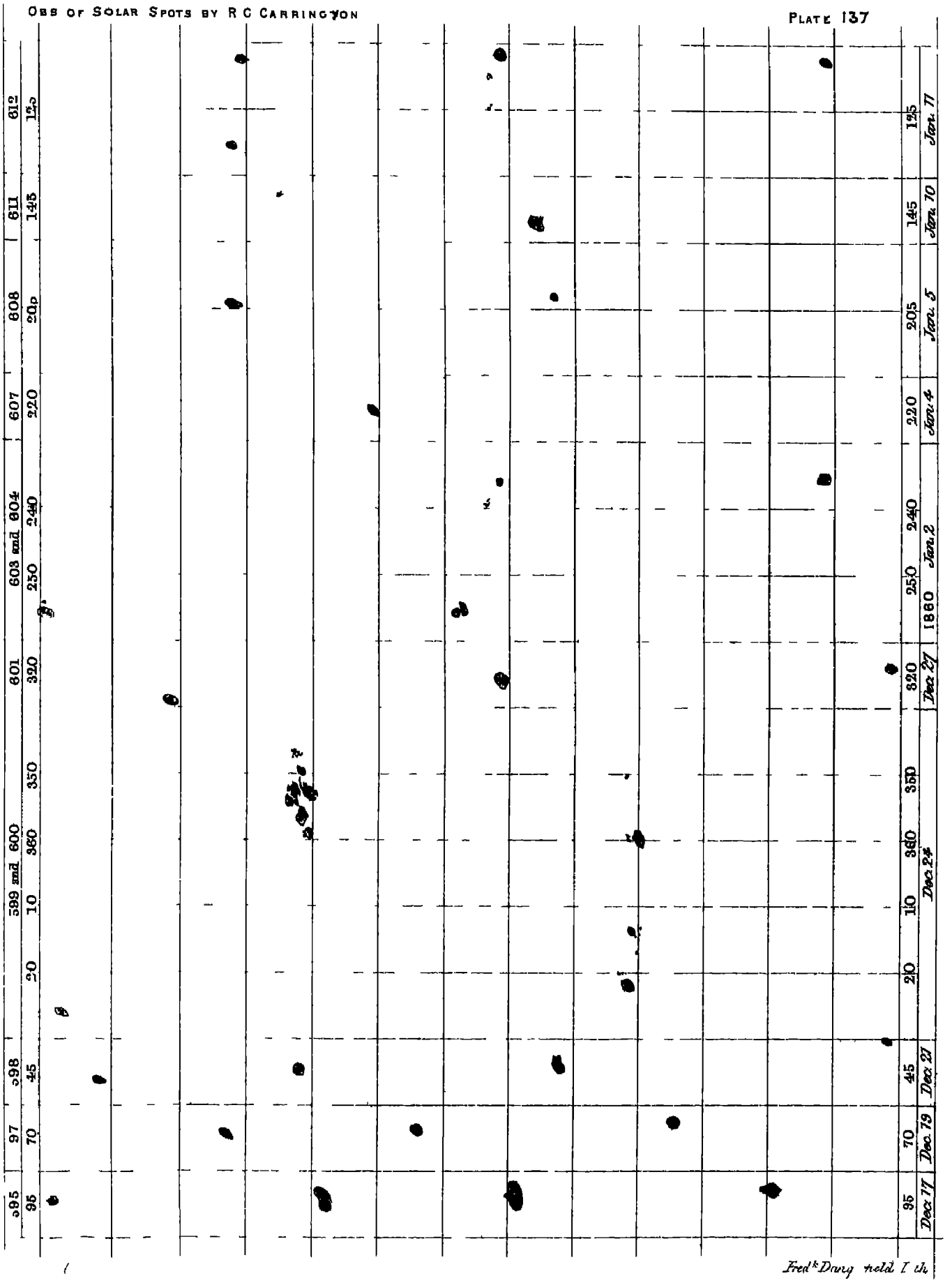

551 564 565 566 568 568 569 570 571 573 576
225 305 275 265 245 240 240 215 205 180 145 120
OBS OF SOLAR SPOTS BY R C CARRINGTON
PLATE 135
225 305 275 265 245 240 240 215 205 180 145 120
Oct 14 Nov 4 Nov 7 Nov 8 Nov 9 Nov 9 Nov 11 Nov 12 Nov 14 Nov 16 Nov 18

1859


577 579 581 582 583 584 588 and 589 590 591 and 592
95 90 45 40 30 5 200 180 185 160 150
OBS'D SOLAR SPOTS BY R C CARRINGTON
PLATE 13B
95 90 45 40 30 5 200 180 185 160 150
Nov 20 Nov 20 Nov 24 Nov 24 Nov 25 Nov 27 Dec 10 Dec 11 Dec 13

Obs of Solar Spots by R C Carrington

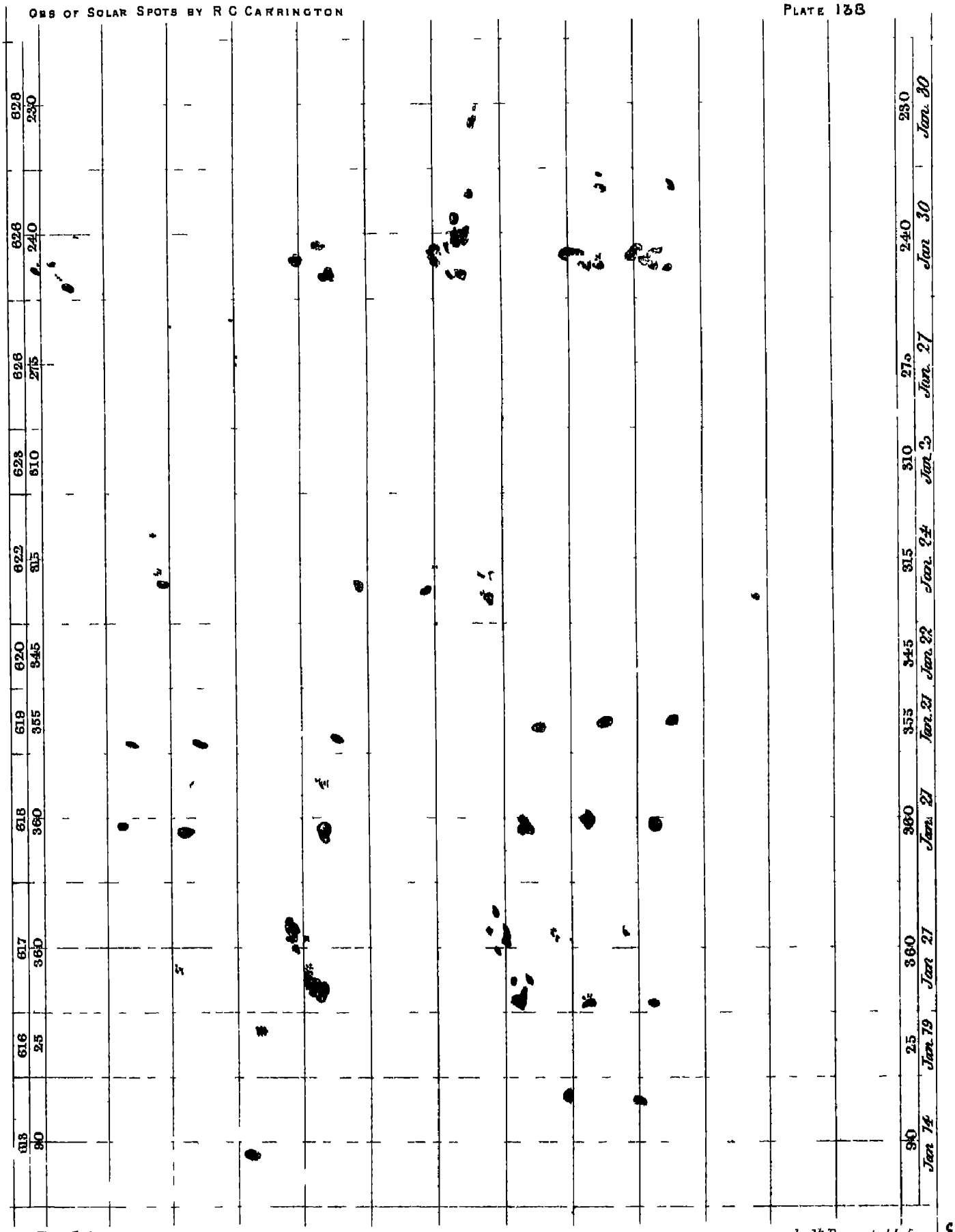
Plate 137



Fredk Dang held I th

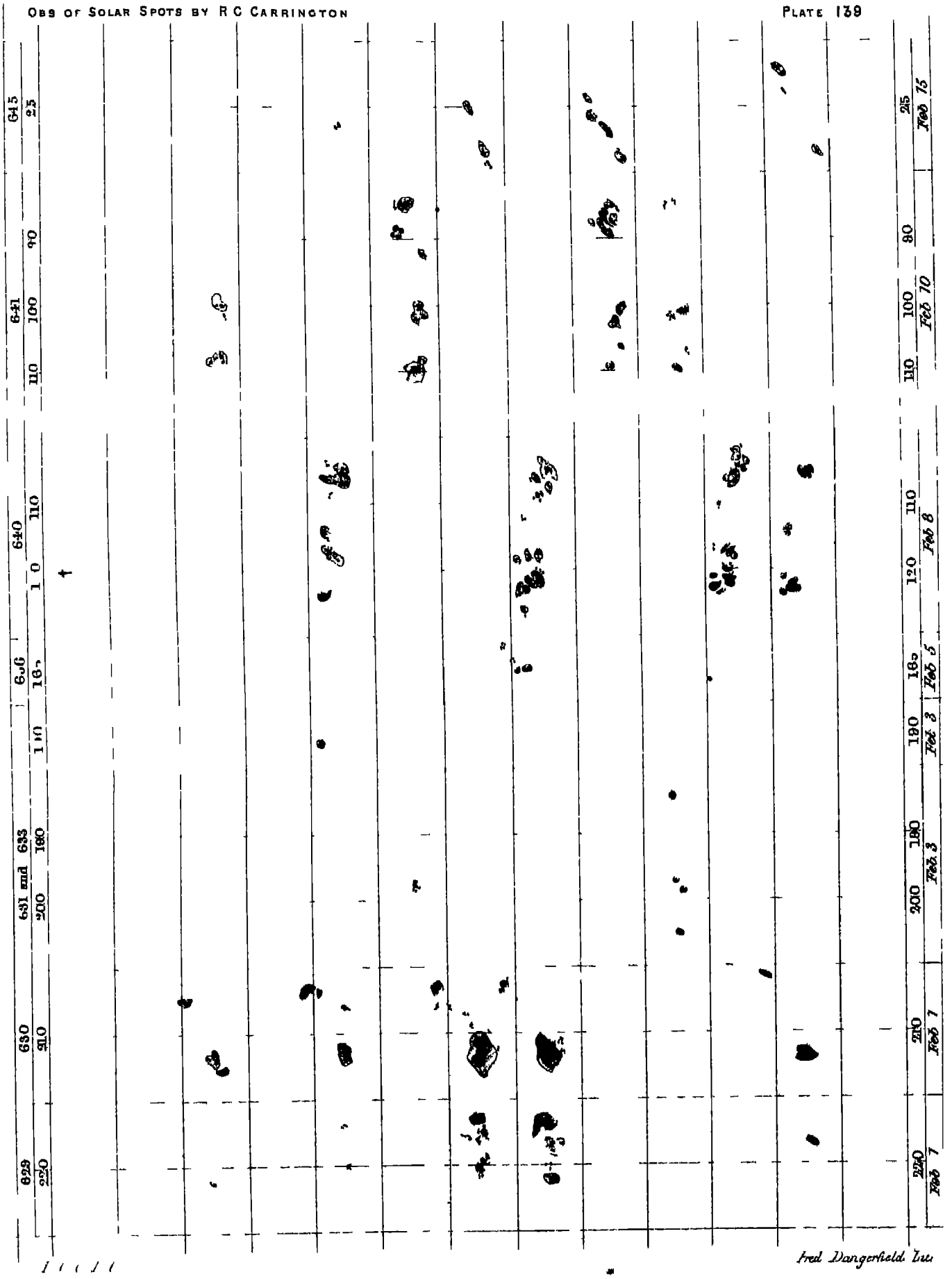
Obs of Solar Spots by R C Carrington

Plate 138

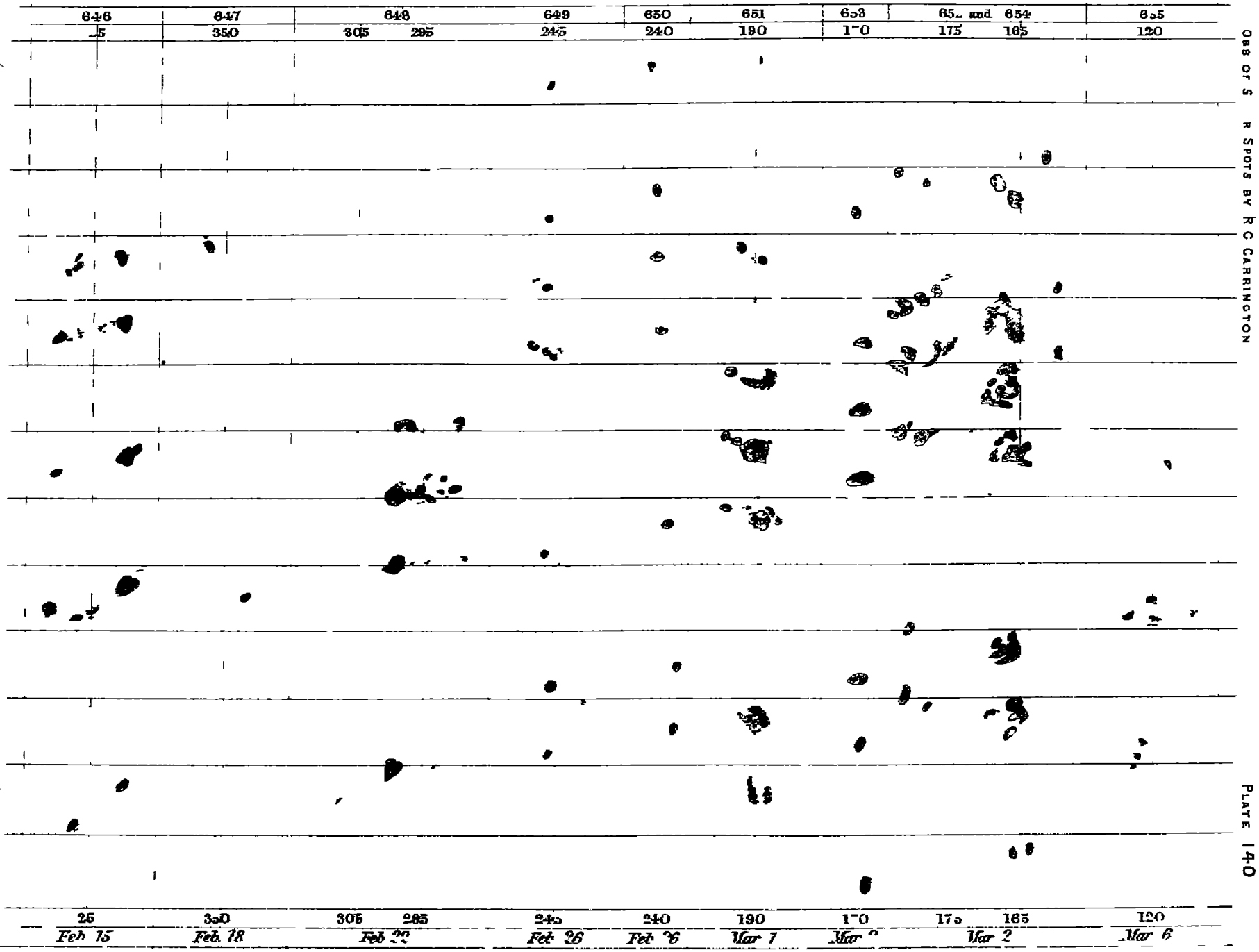


R C D L

Fred^k Dangerfield Lith



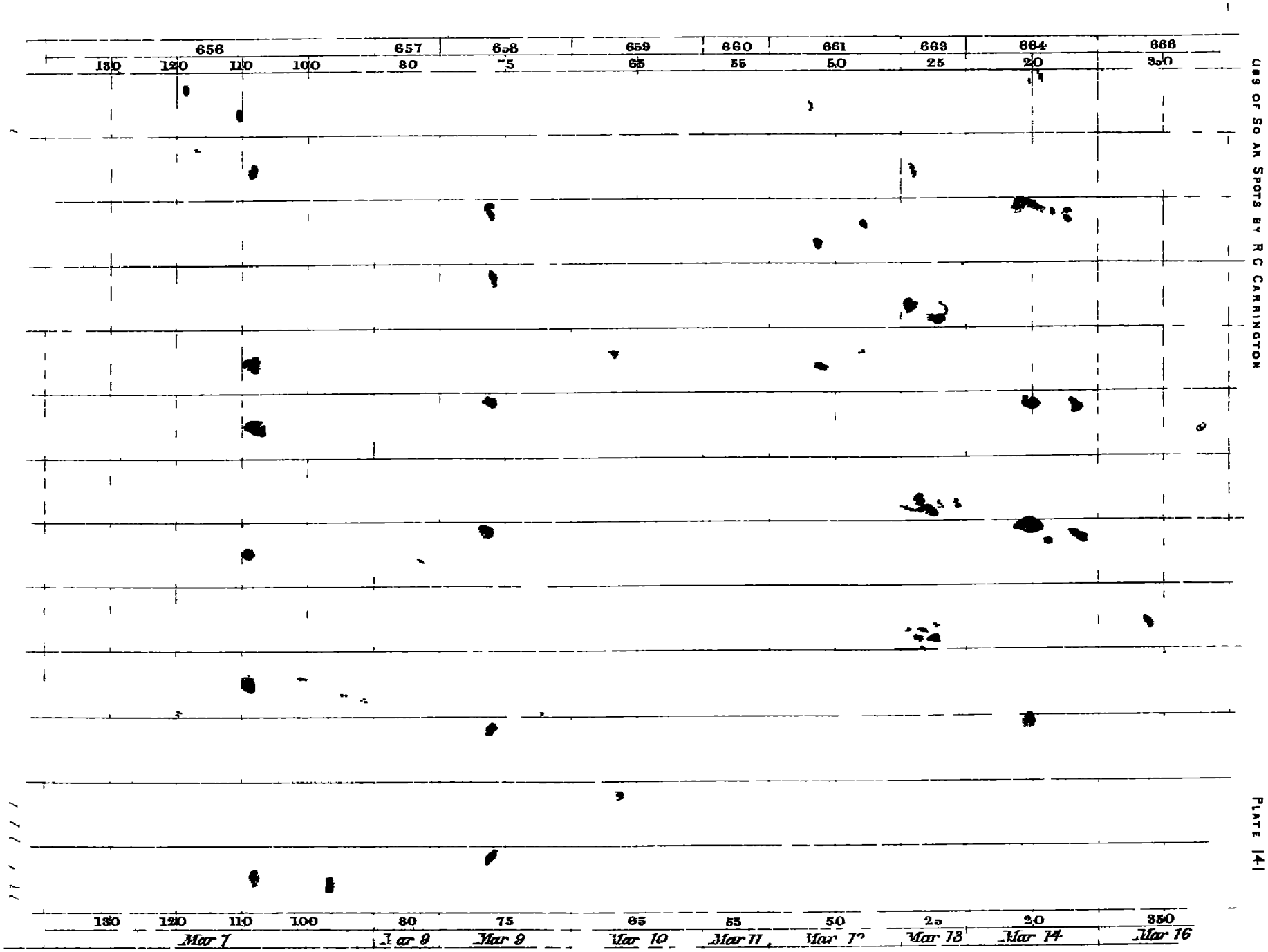
Fred Dangerfield Lith



OBS OF SUN SPOTS BY R C CARRINGTON

PLATE 140

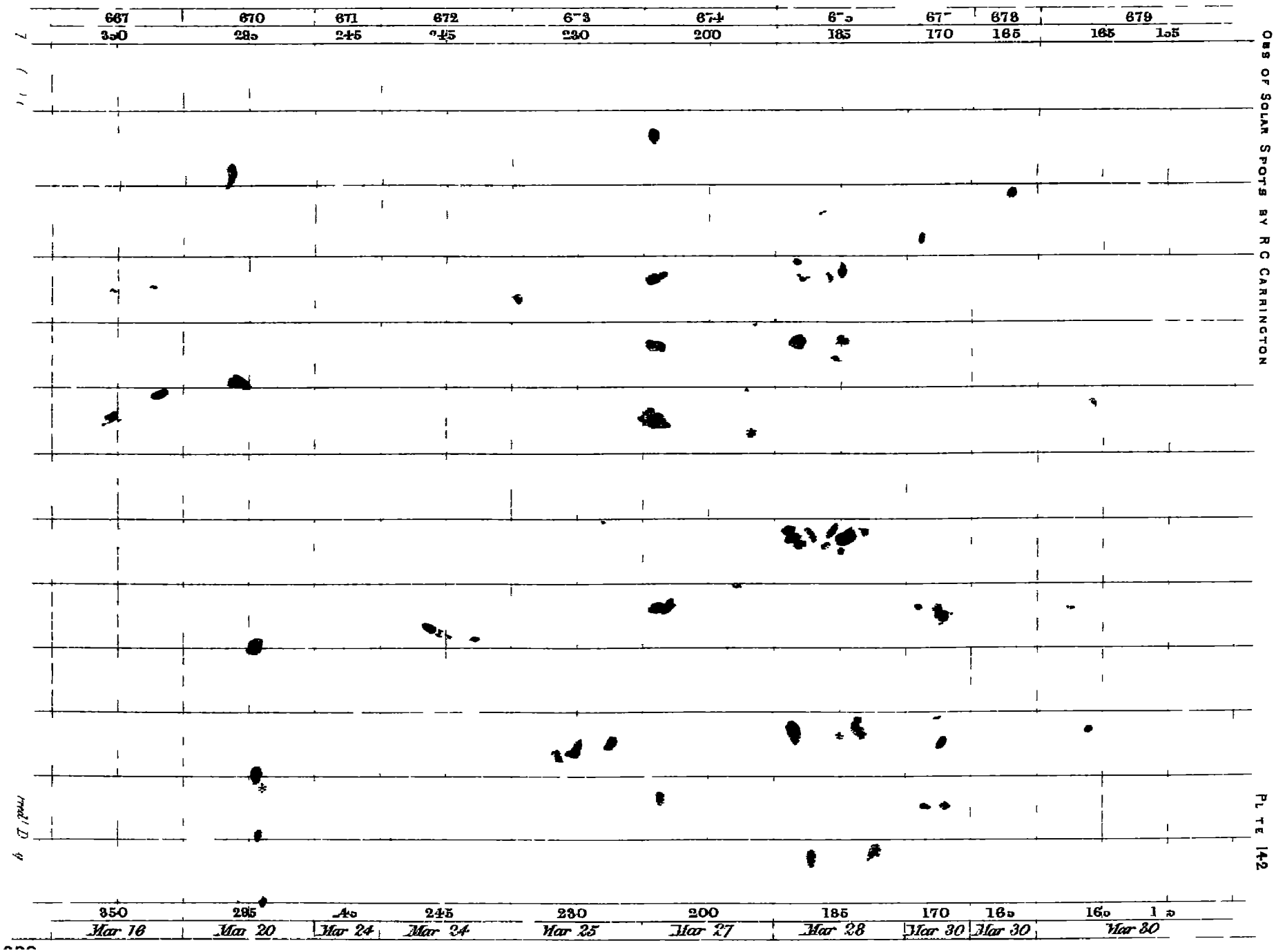
1860.

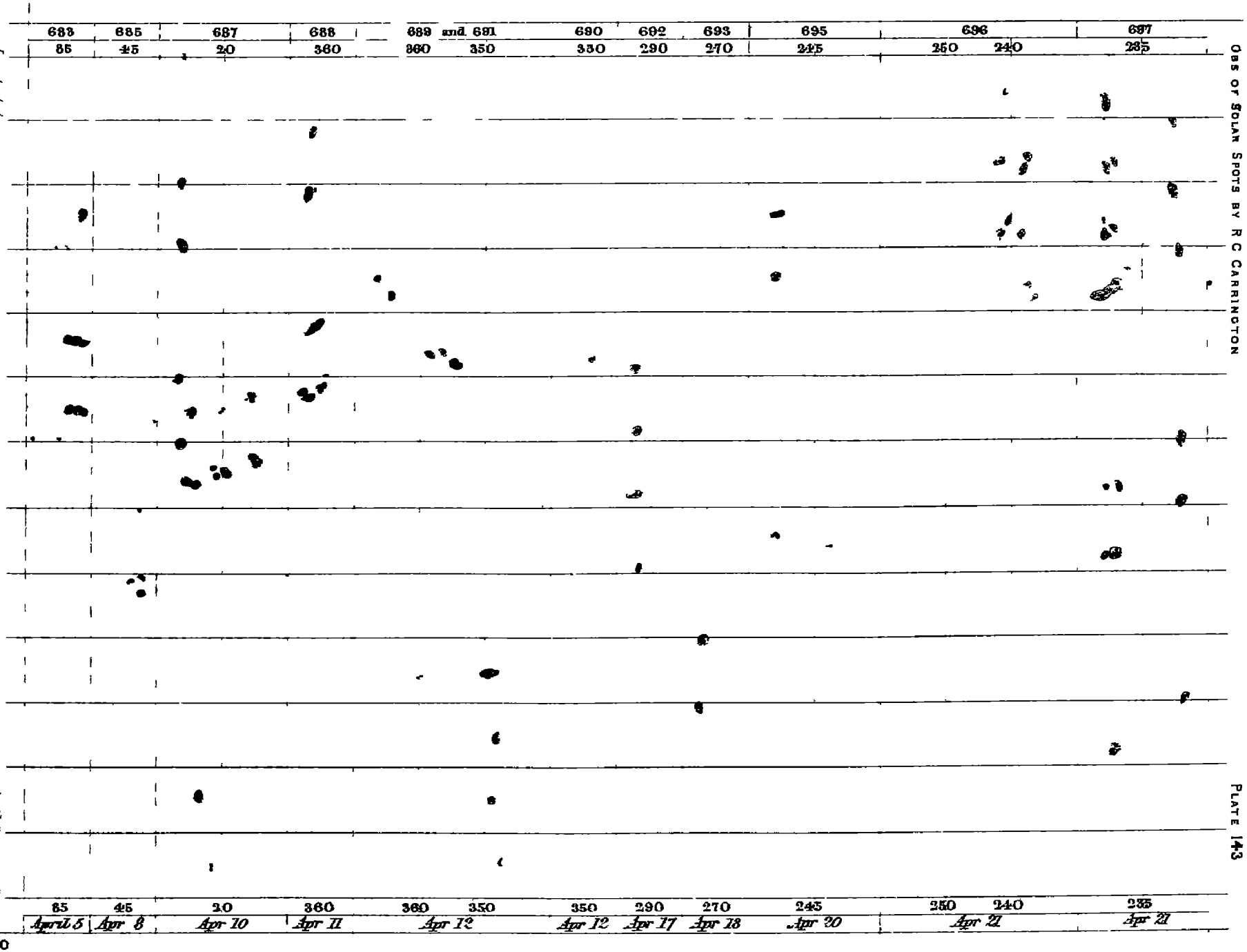


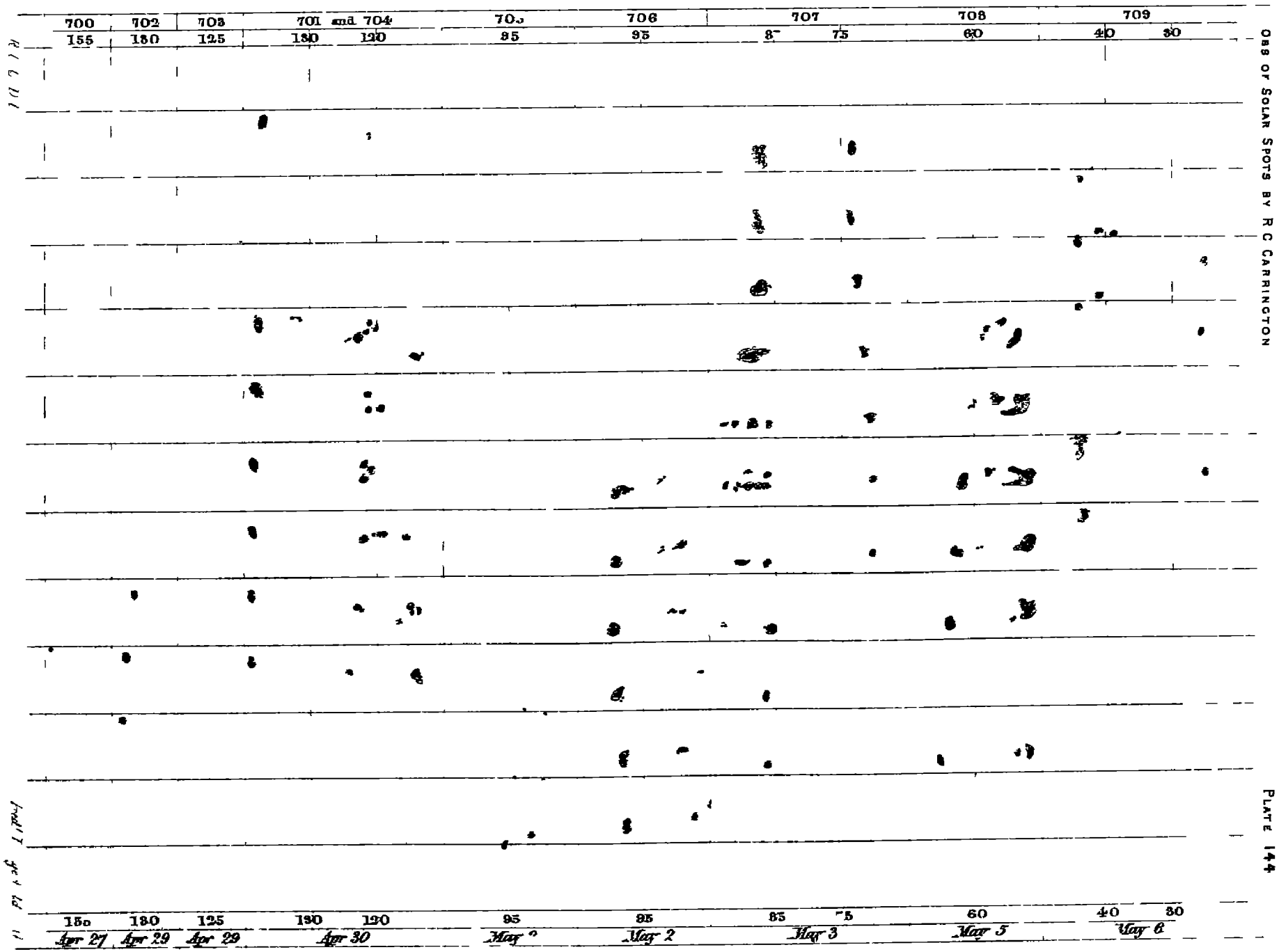
USE OF SO AR SPOTS BY R C CARRINGTON

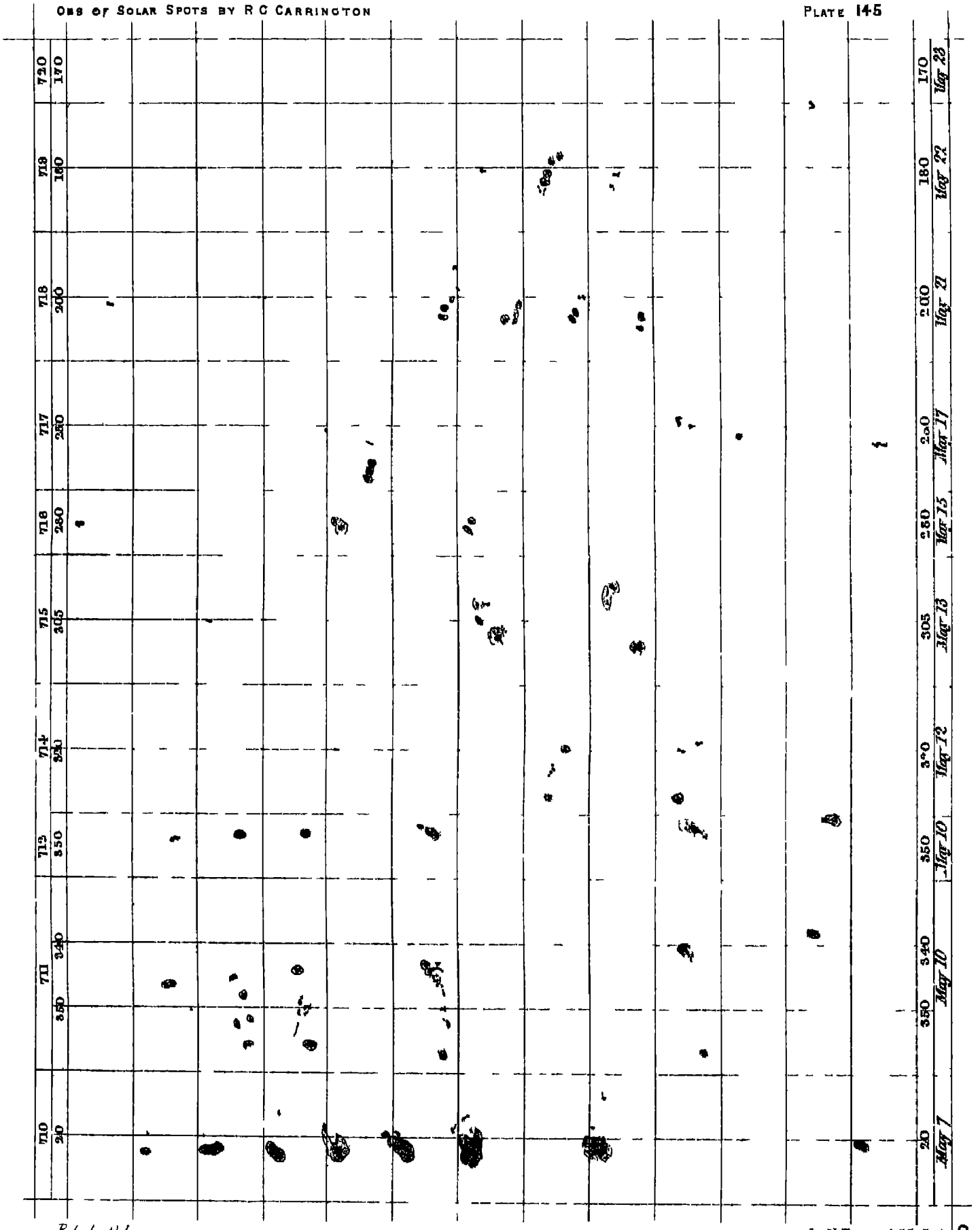
PLATE 14

1860


667 670 671 672 673 674 675 677 678 679
350 295 245 245 230 200 185 170 165 165 105
350 295 245 245 230 200 185 170 165 165
Mar 16 Mar 20 Mar 24 Mar 24 Mar 25 Mar 27 Mar 28 Mar 30 Mar 30 Mar 30
OBS OF SOLAR SPOTS BY R C CARRINGTON
PLATE 142


683 685 687 688 689 and 691 690 692 693 695 696 697
85 45 20 360 360 350 350 290 270 245 250 240 235
85 45 20 360 360 350 350 290 270 245 250 240 235
April 5 Apr 8 Apr 10 Apr 11 Apr 12 Apr 12 Apr 17 Apr 18 Apr 20 Apr 21 Apr 22


700
155
702
180
703
125
701 and 704
180
120
705
95
706
95
707
85
75
708
60
709
40
30
Apr 27
Apr 29
Apr 29
Apr 30
May 1
May 2
May 3
May 5
May 6



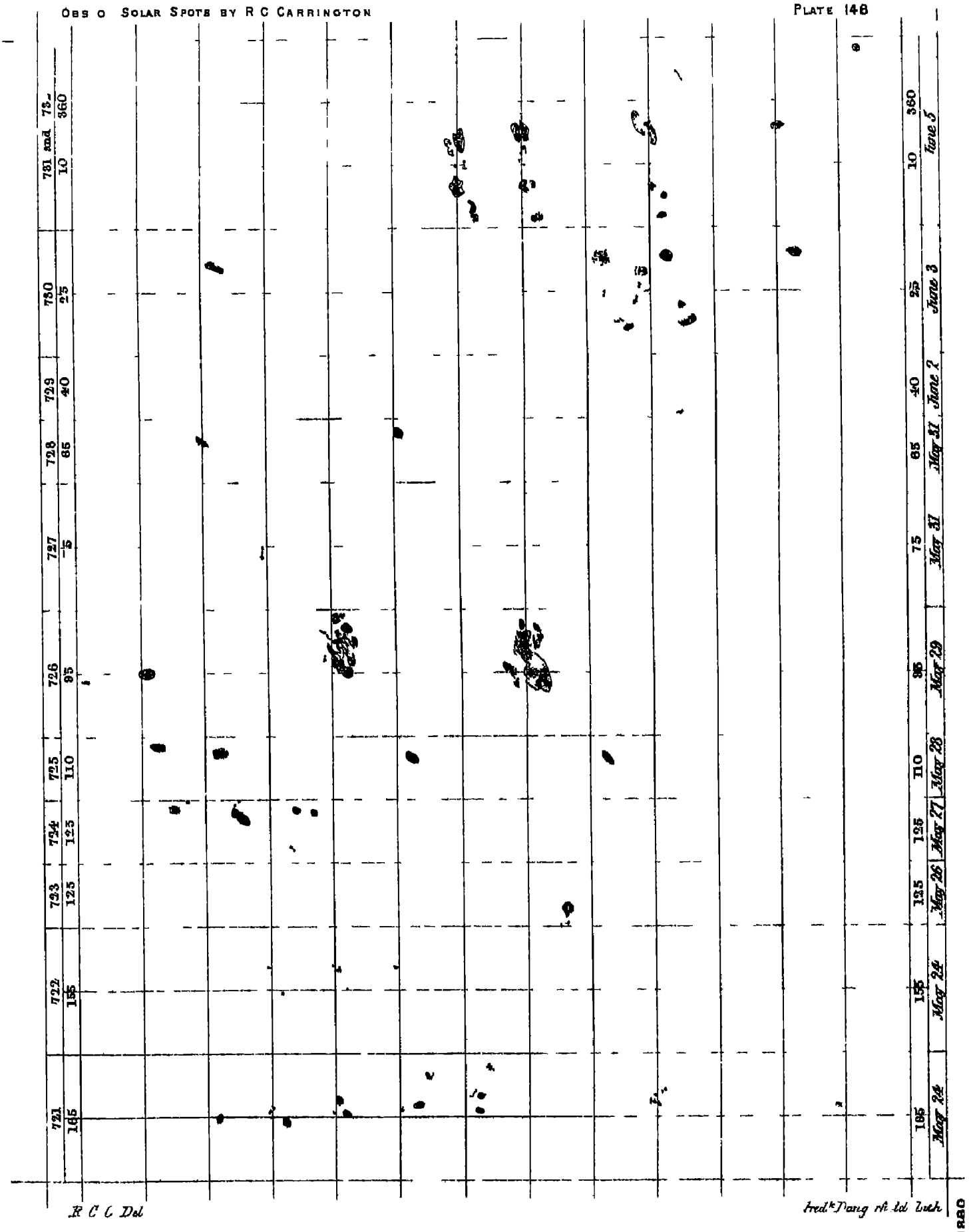
R C C D L

Fredk Dangerfield Lith

1860

Obs o Solar Spots by R C Carrington

Plate 148



R C C Del

Fredk Dang rh ld Lith

1880

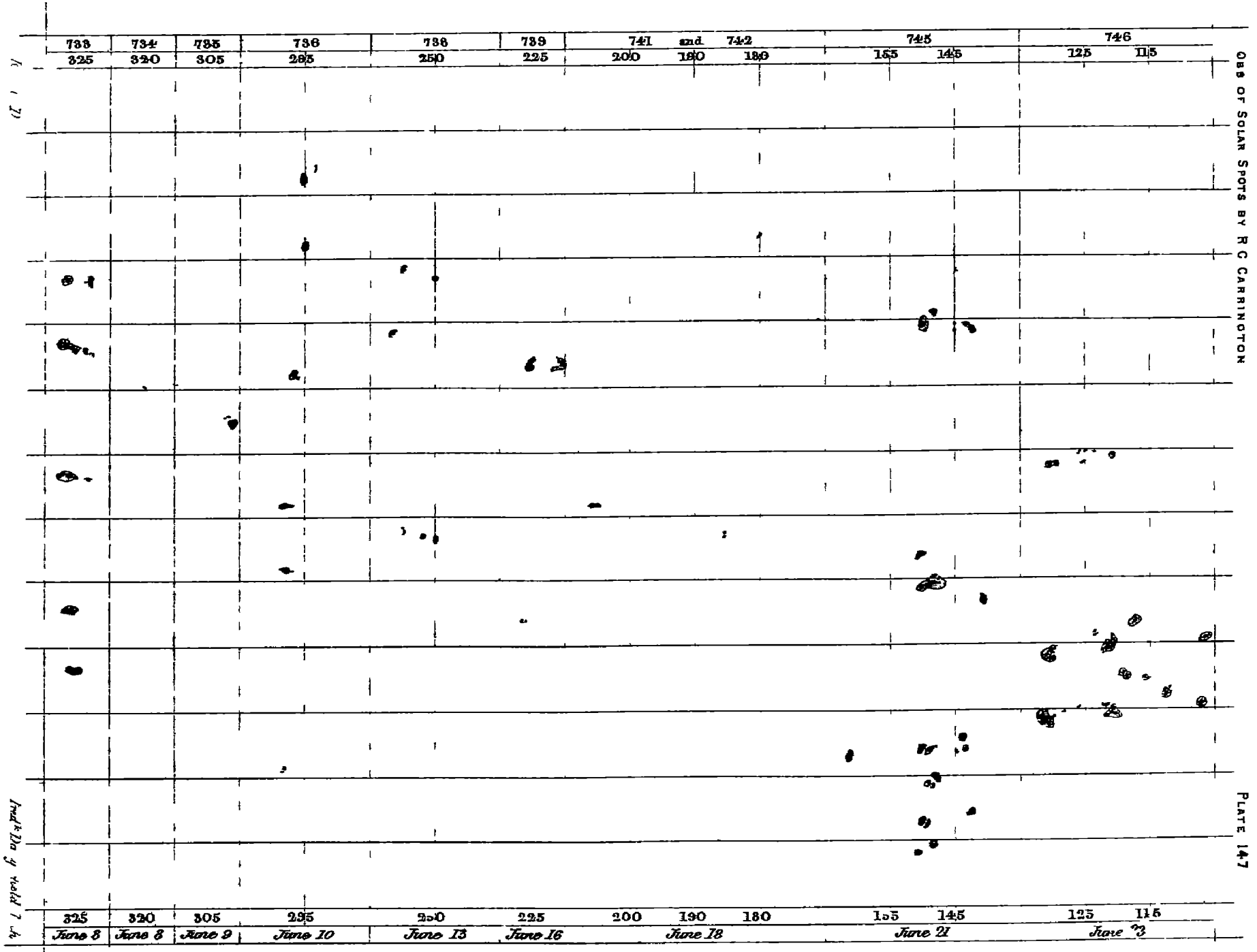
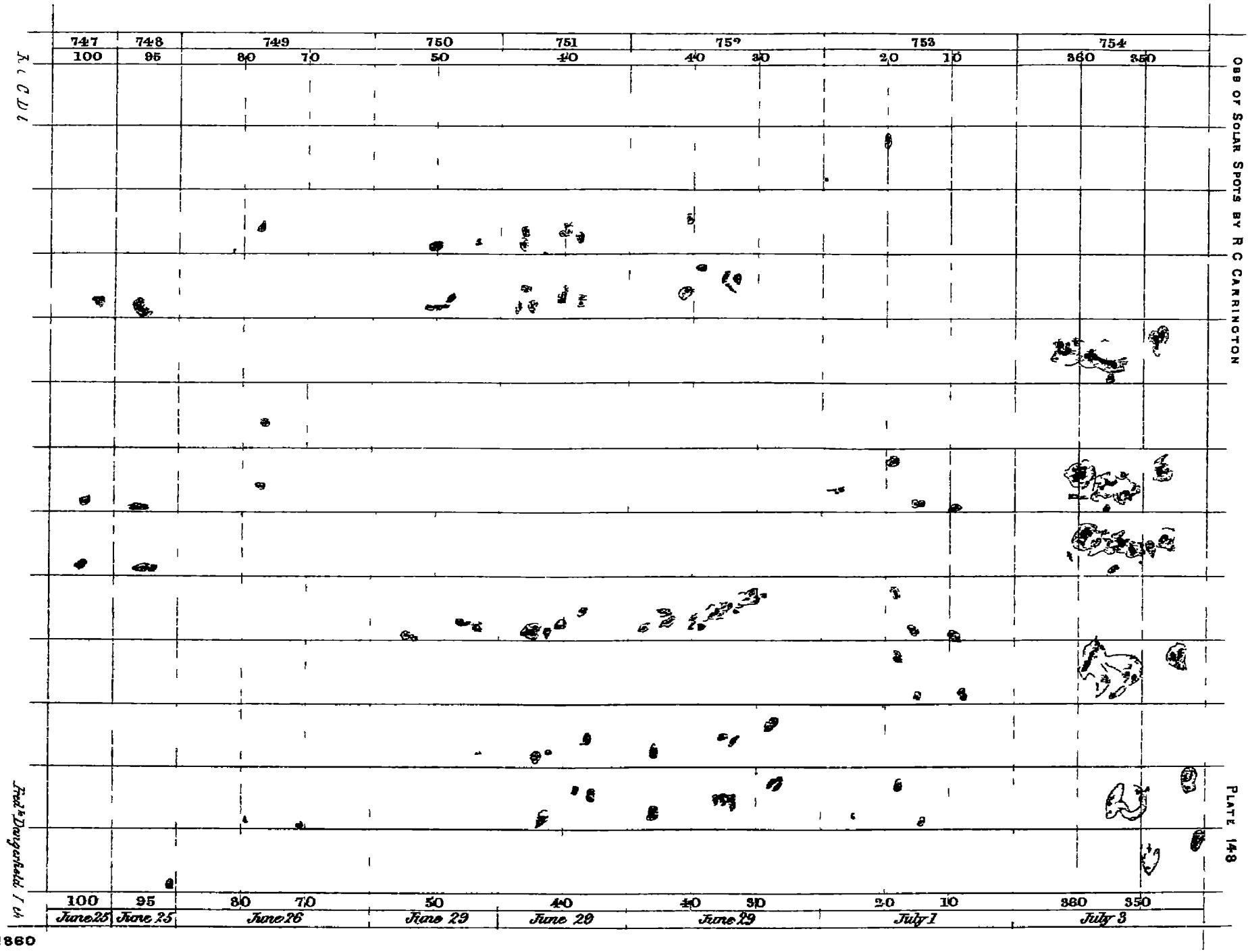


PLATE 147

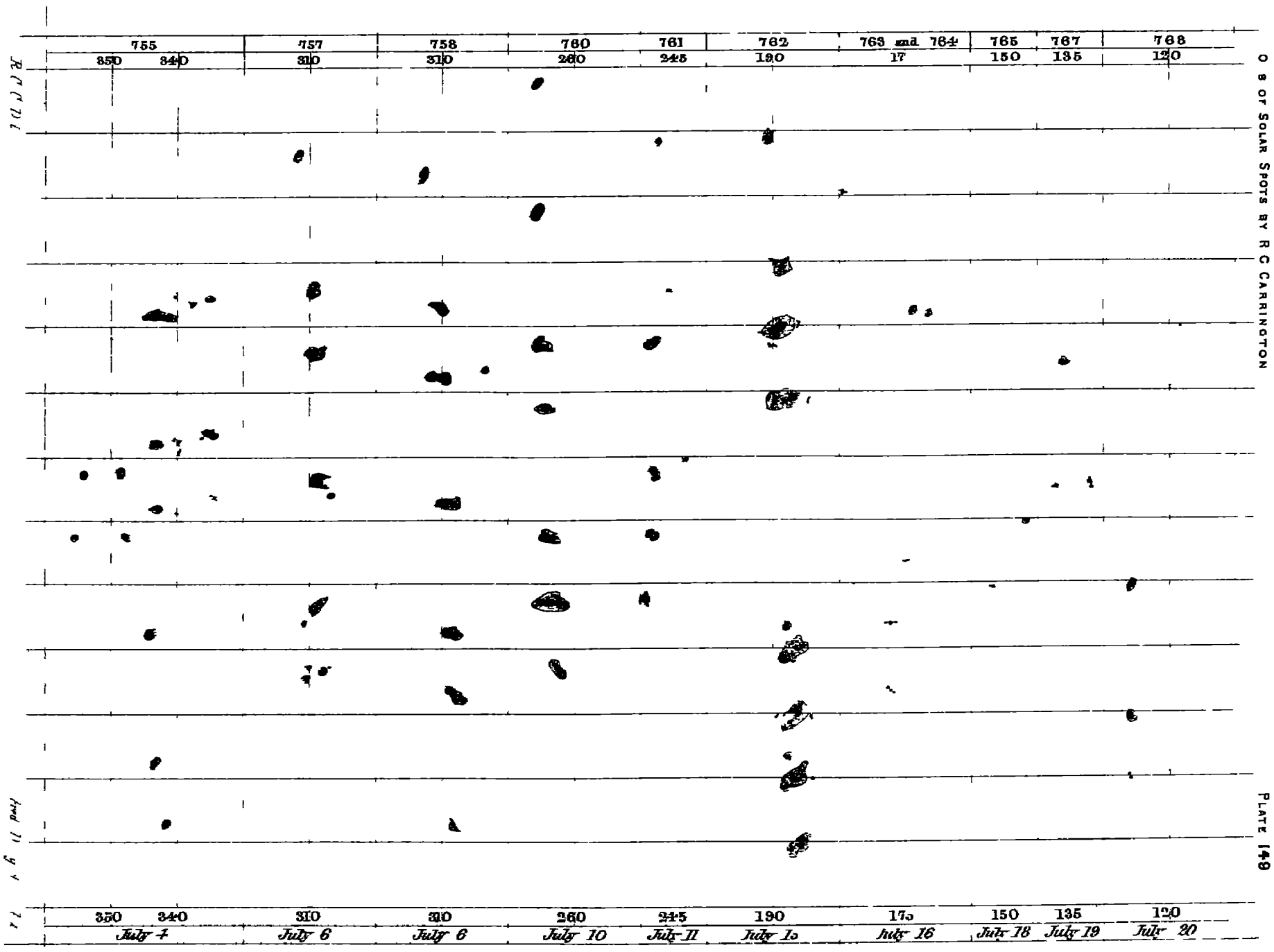
1860



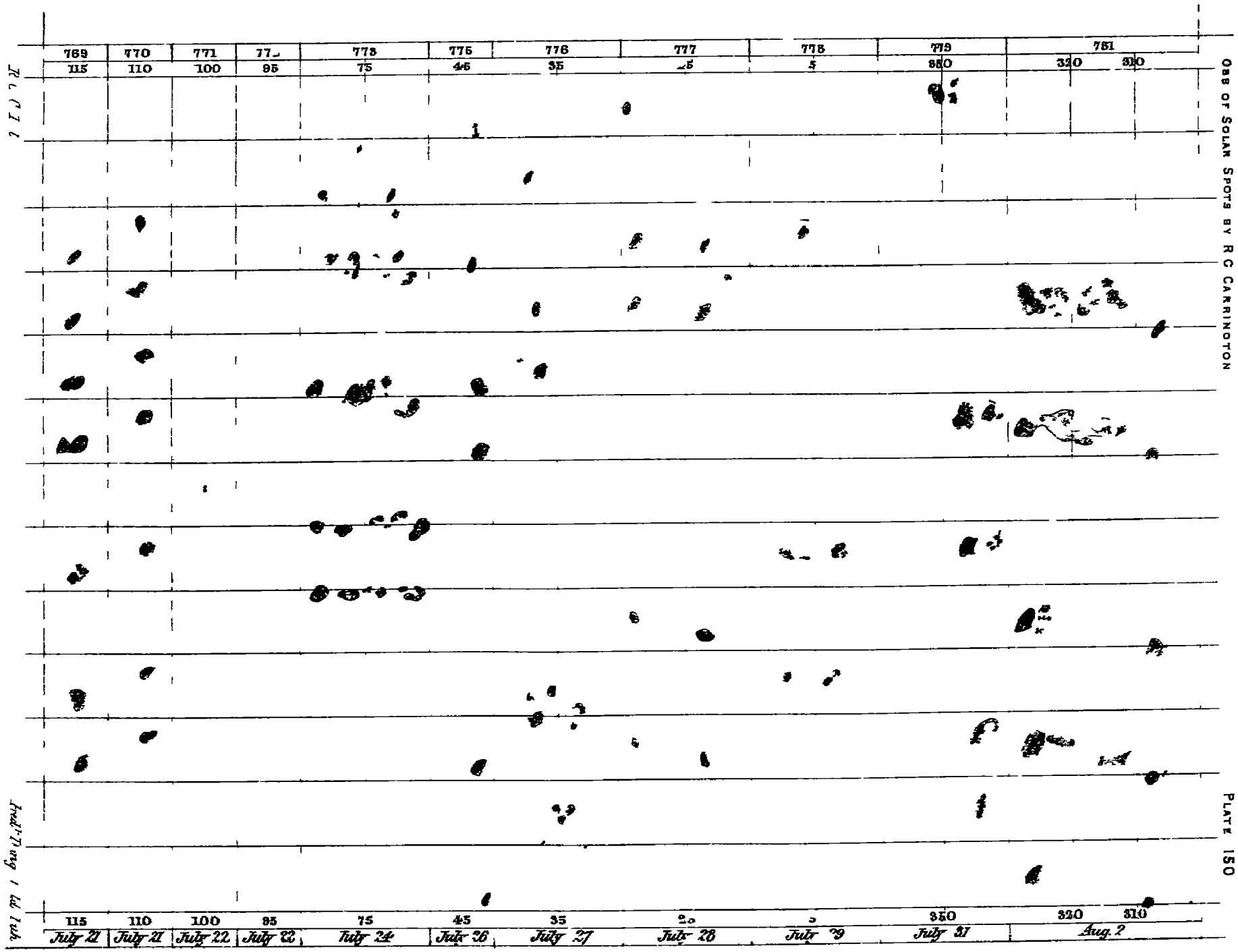
OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 148

1860


755
757
758
760
761
762
763 and 764
765
767
768
350
340
310
310
260
245
190
17
150
135
120
July 4
July 6
July 6
July 10
July 11
July 15
July 16
July 18
July 19
July 20
O S OF SOLAR SPOTS BY R C CARRINGTON
PLATE 149

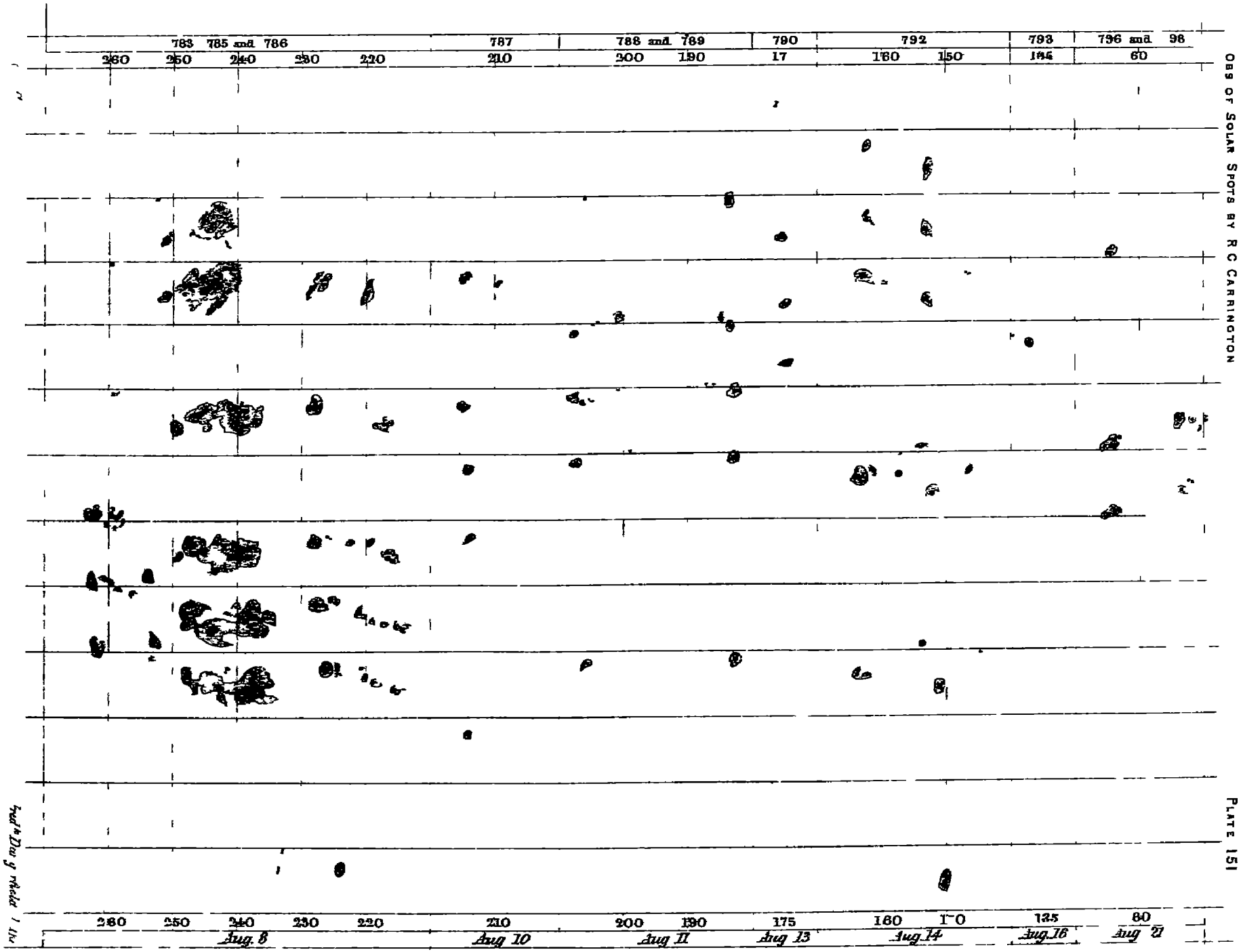
1860



OBS OF SOLAR SPOTS BY R C CARRINGTON

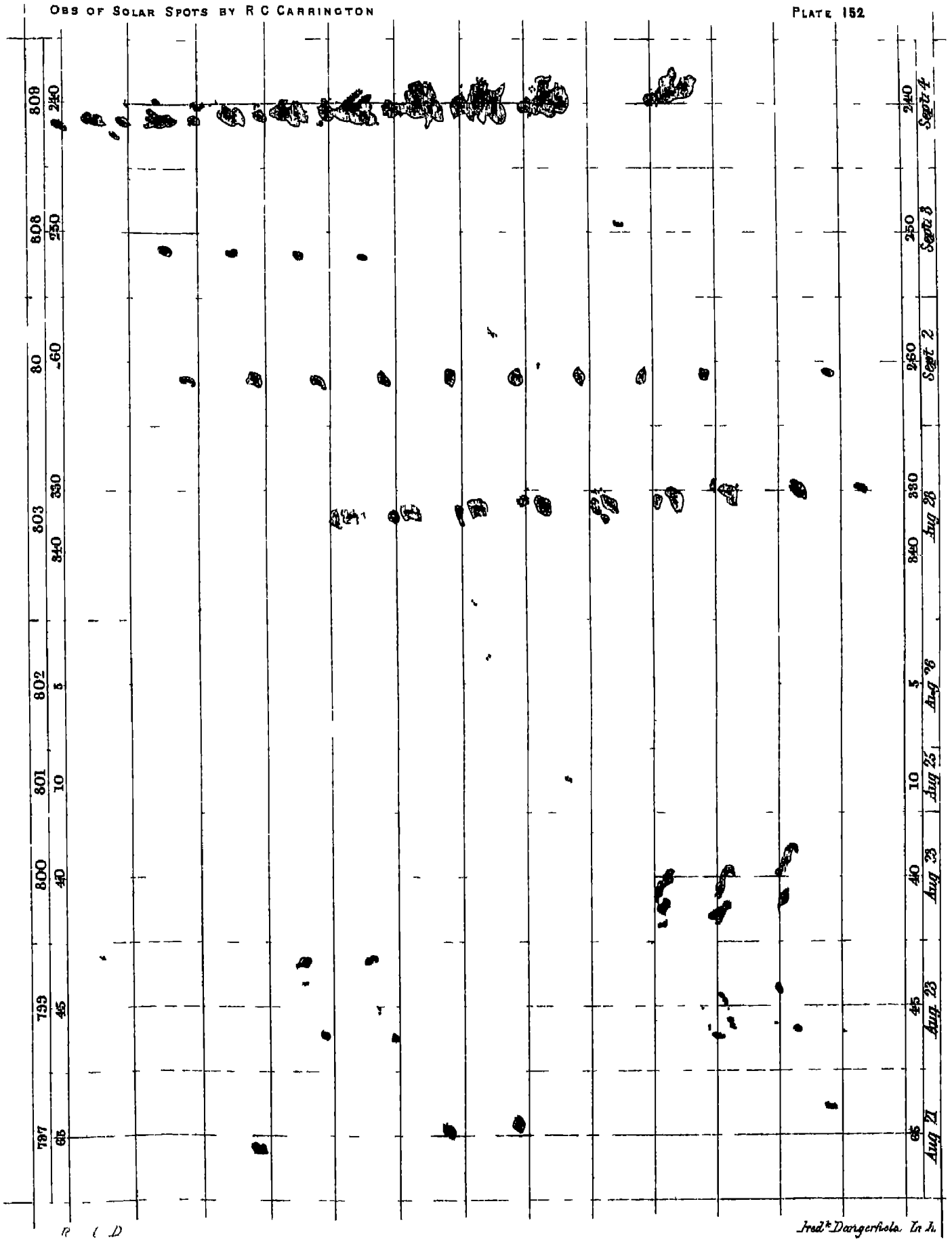
PLATE 150

1860



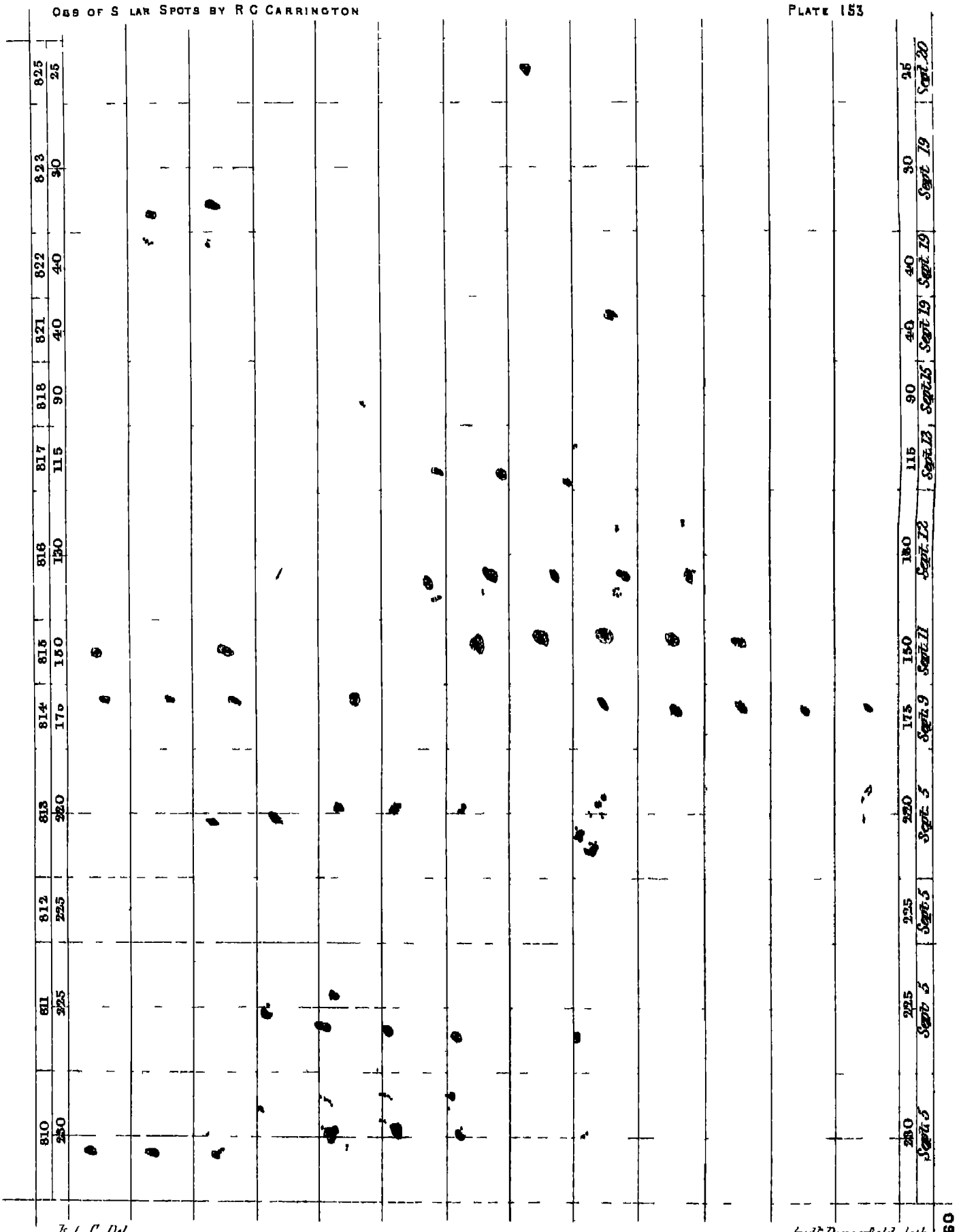
OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 151


Obs of Solar Spots by R C Carrington
Plate 152
808
240
808
250
80
60
803
330
840
802
5
801
10
800
40
799
45
797
65
Sept 4
Sept 3
Sept 2
Aug 28
Aug 26
Aug 25
Aug 23
Aug 23
Aug 21
Fred.k Dangerfield. Ln. h.

Obs of Solar Spots by R C Carrington

Plate 153

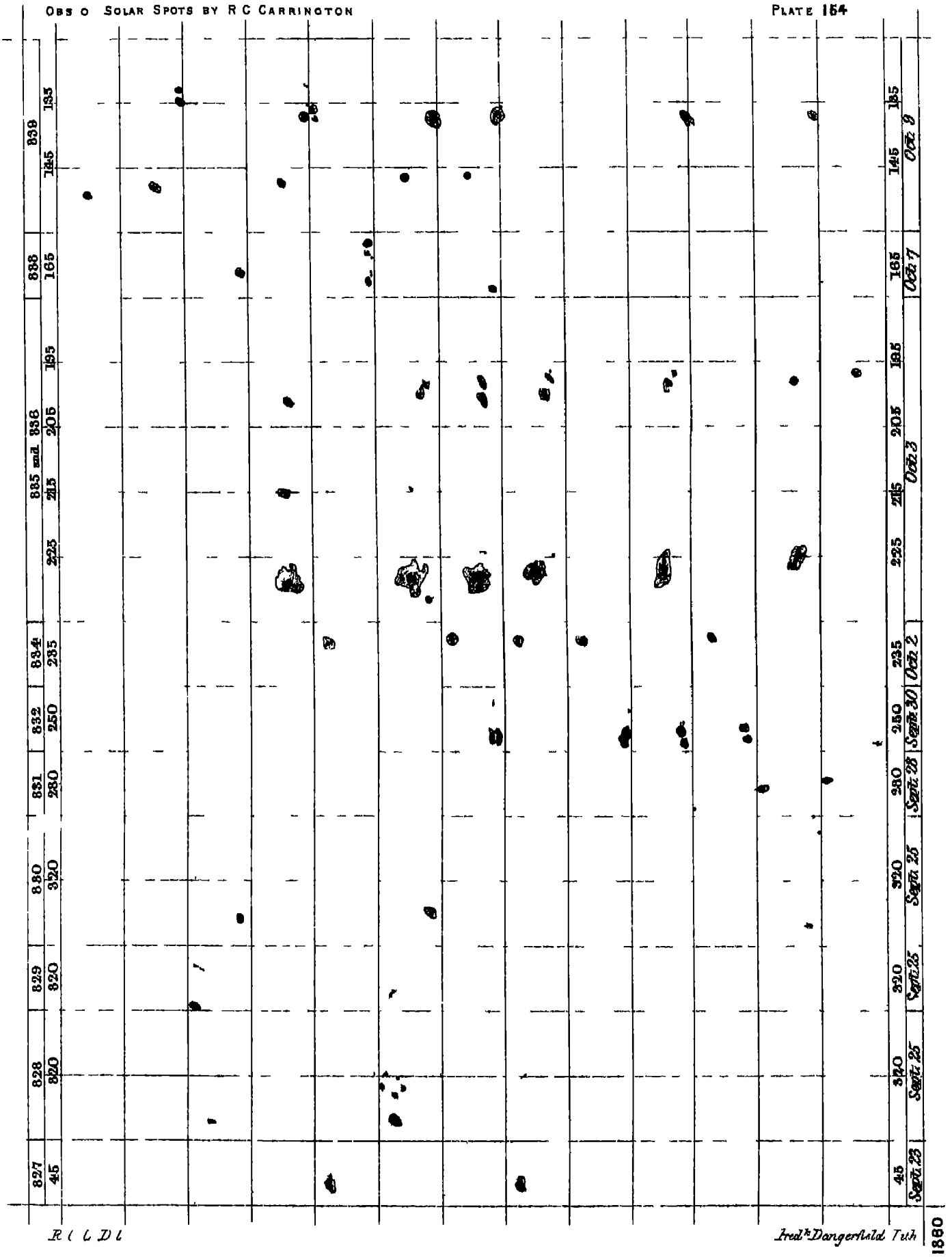


R. C. C. Del.

Fredk Dangerfield Lith.

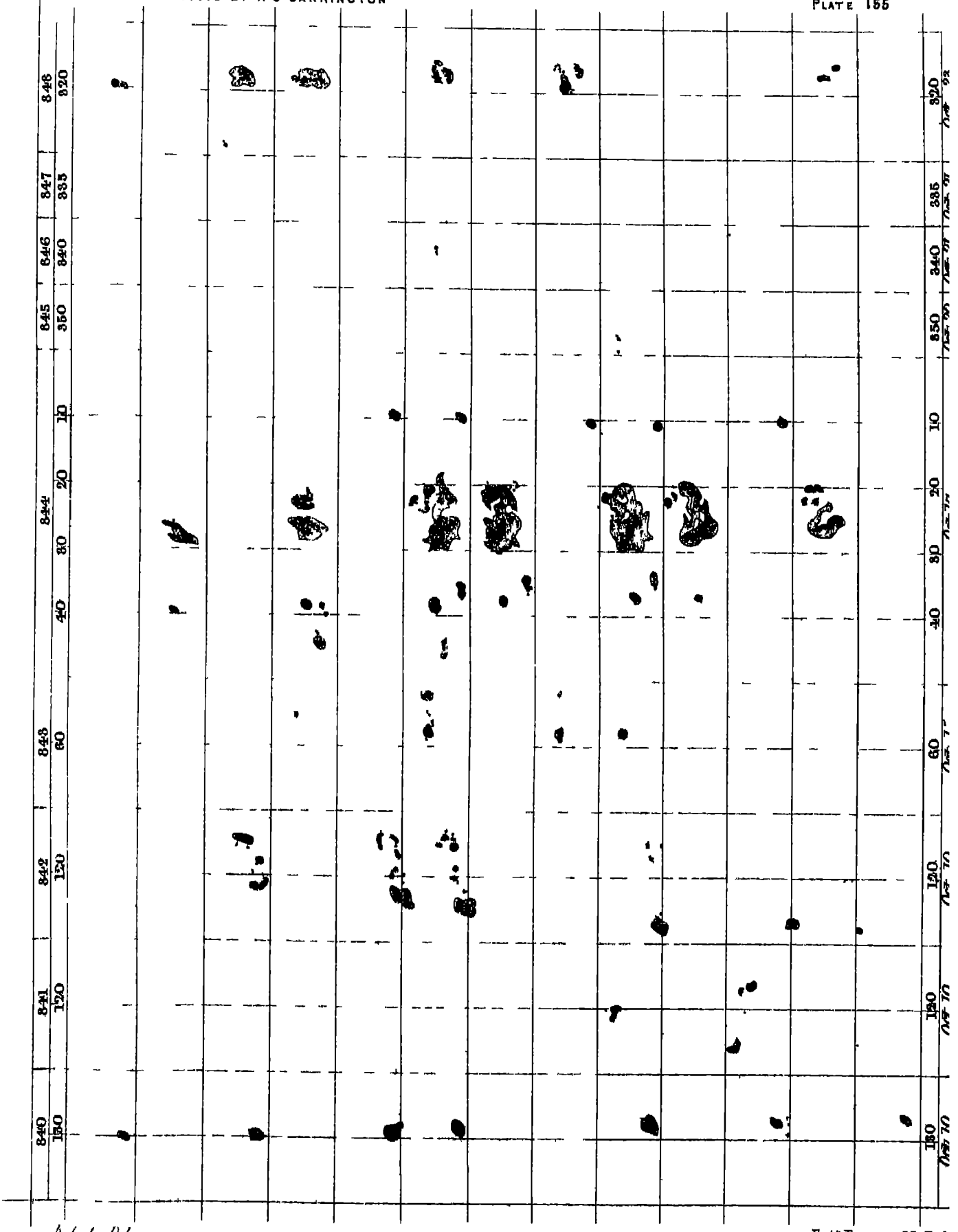
1860

Obs o Solar Spots by R C Carrington Plate 154



OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 155



Fredk Dangerfield Lith

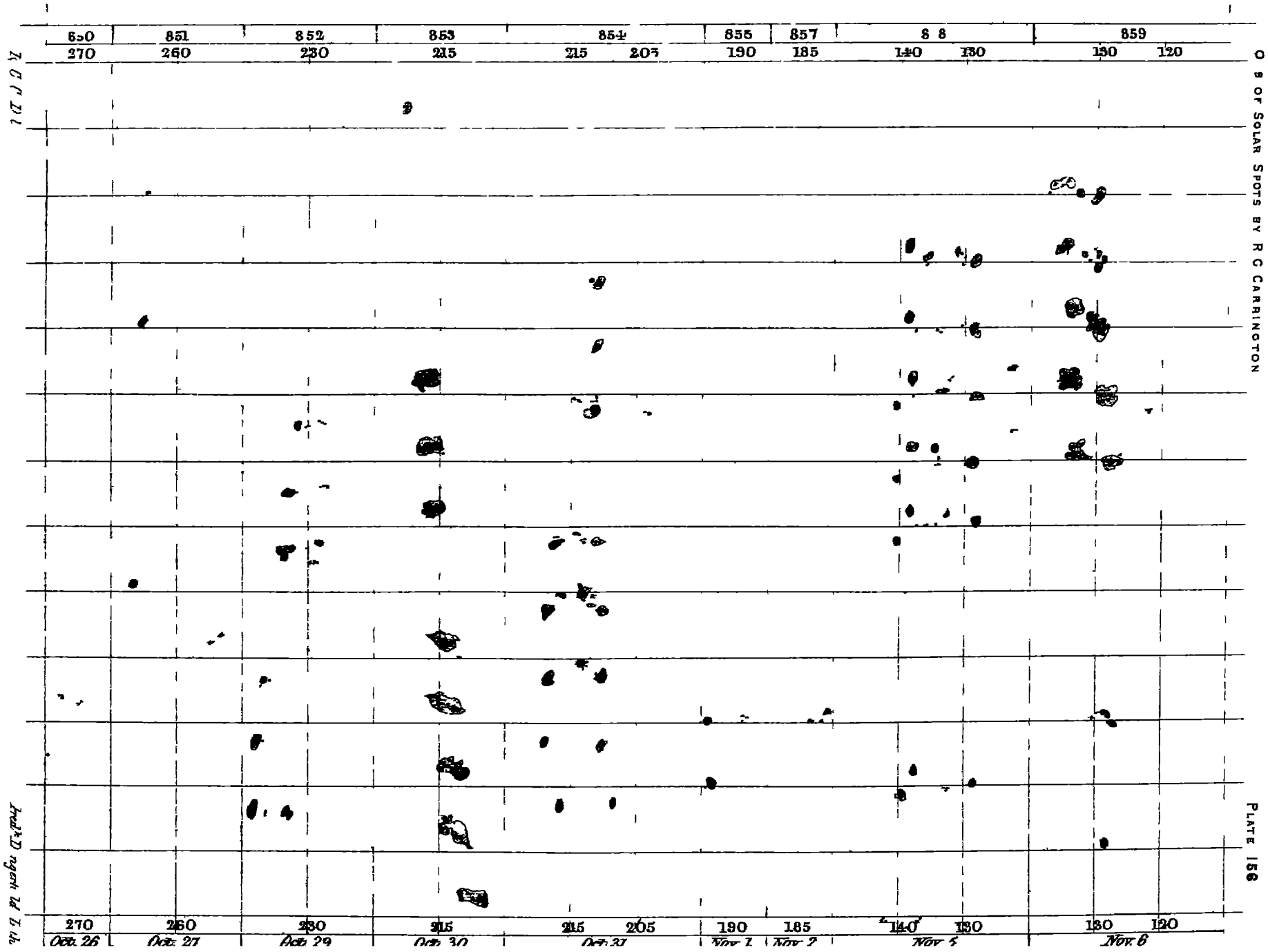


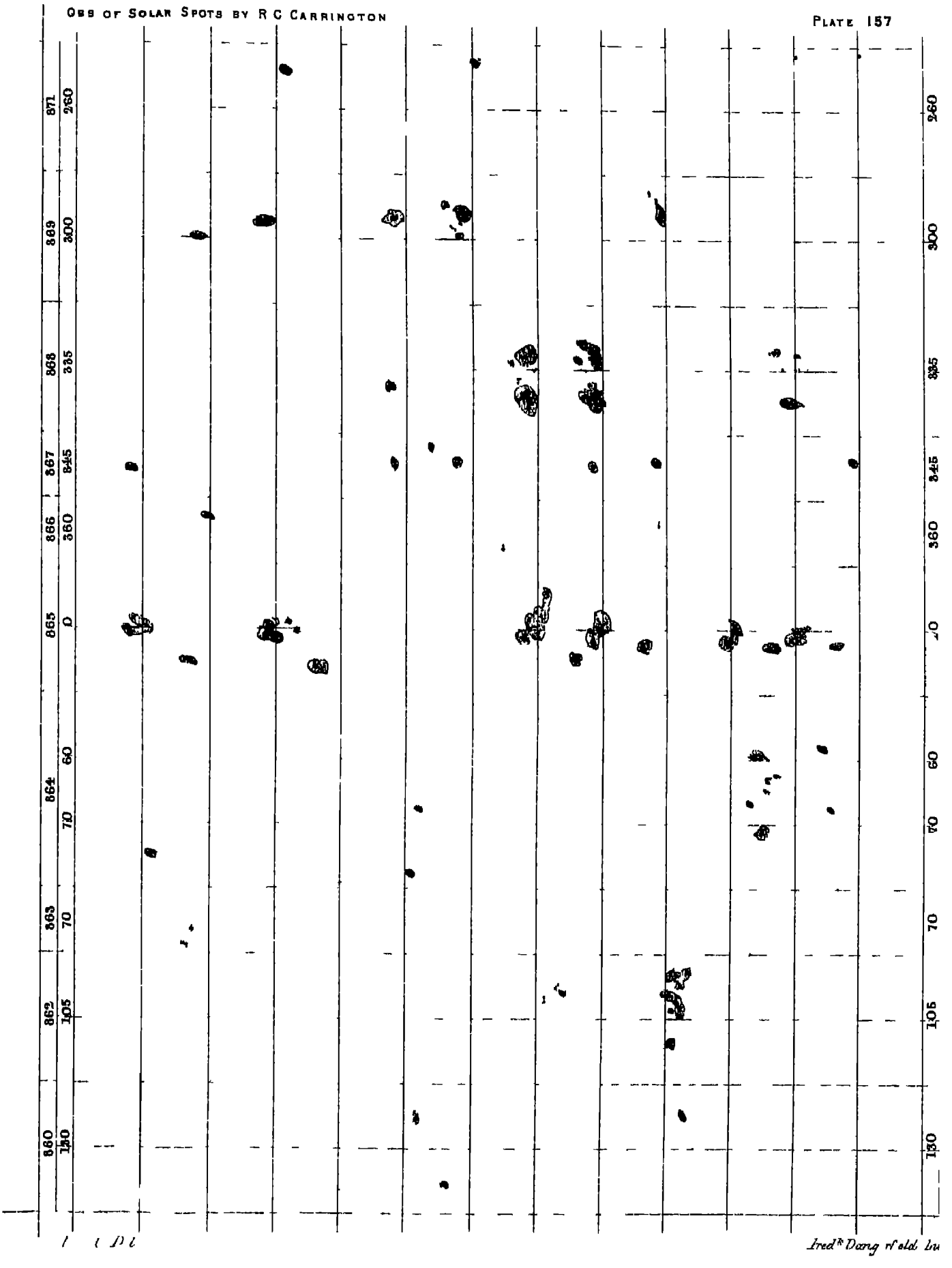
PLATE 156

OBSERVATIONS OF SOLAR SPOTS BY R. C. CARRINGTON

Heliographic latitude

Obs of Solar Spots by R C Carrington

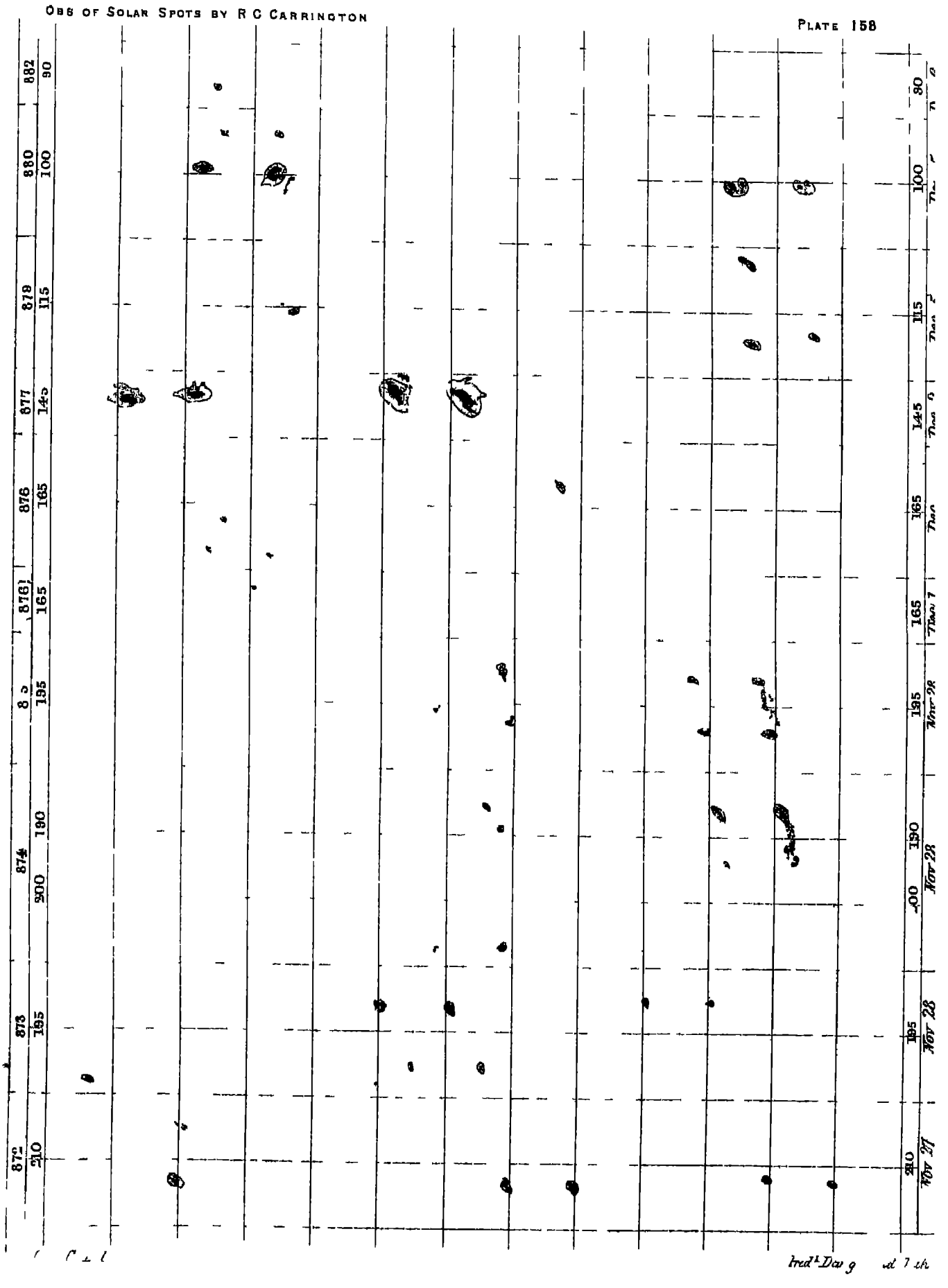
Plate 157

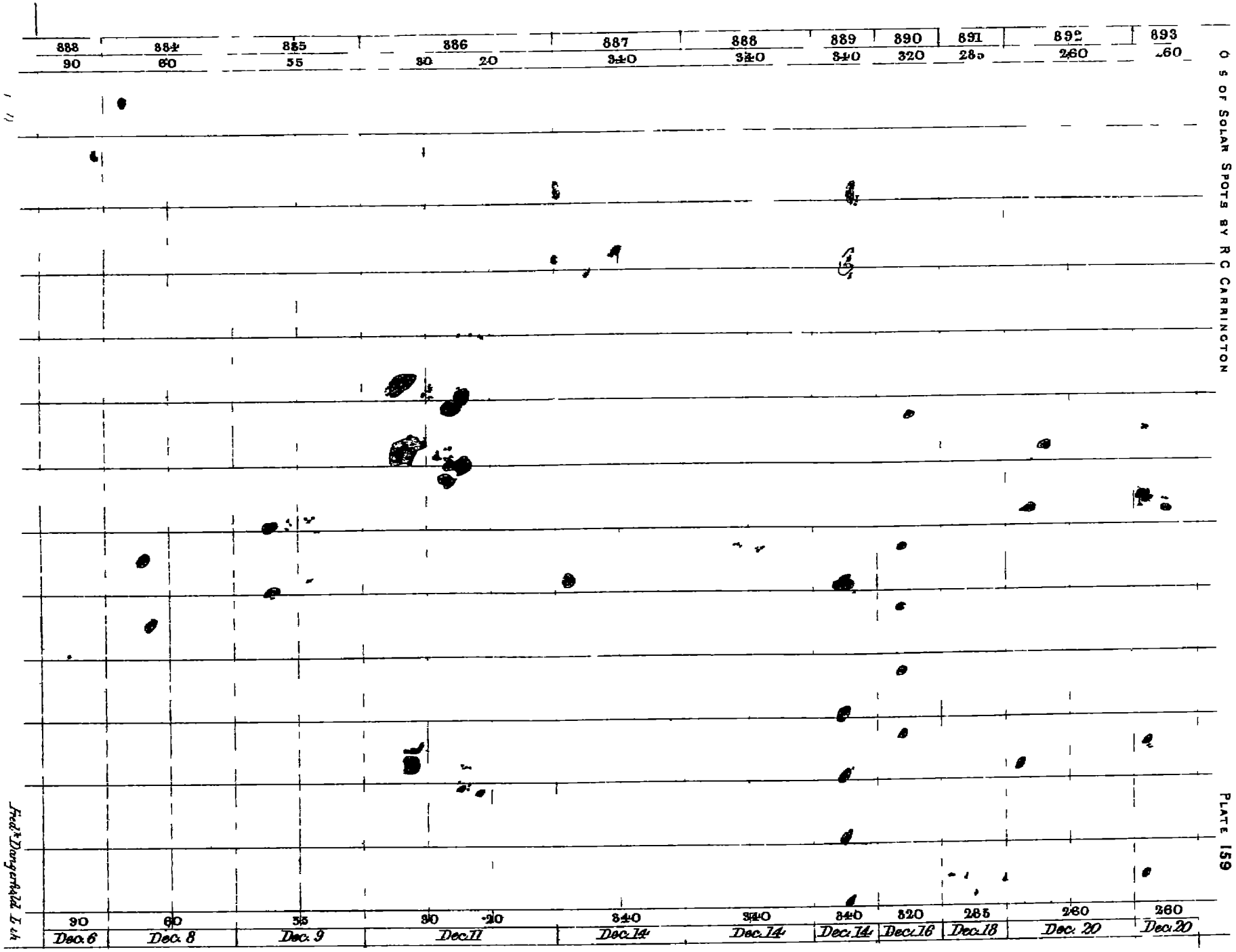


Fred^k Dang rf eld Lu

Obs of Solar Spots by R C Carrington

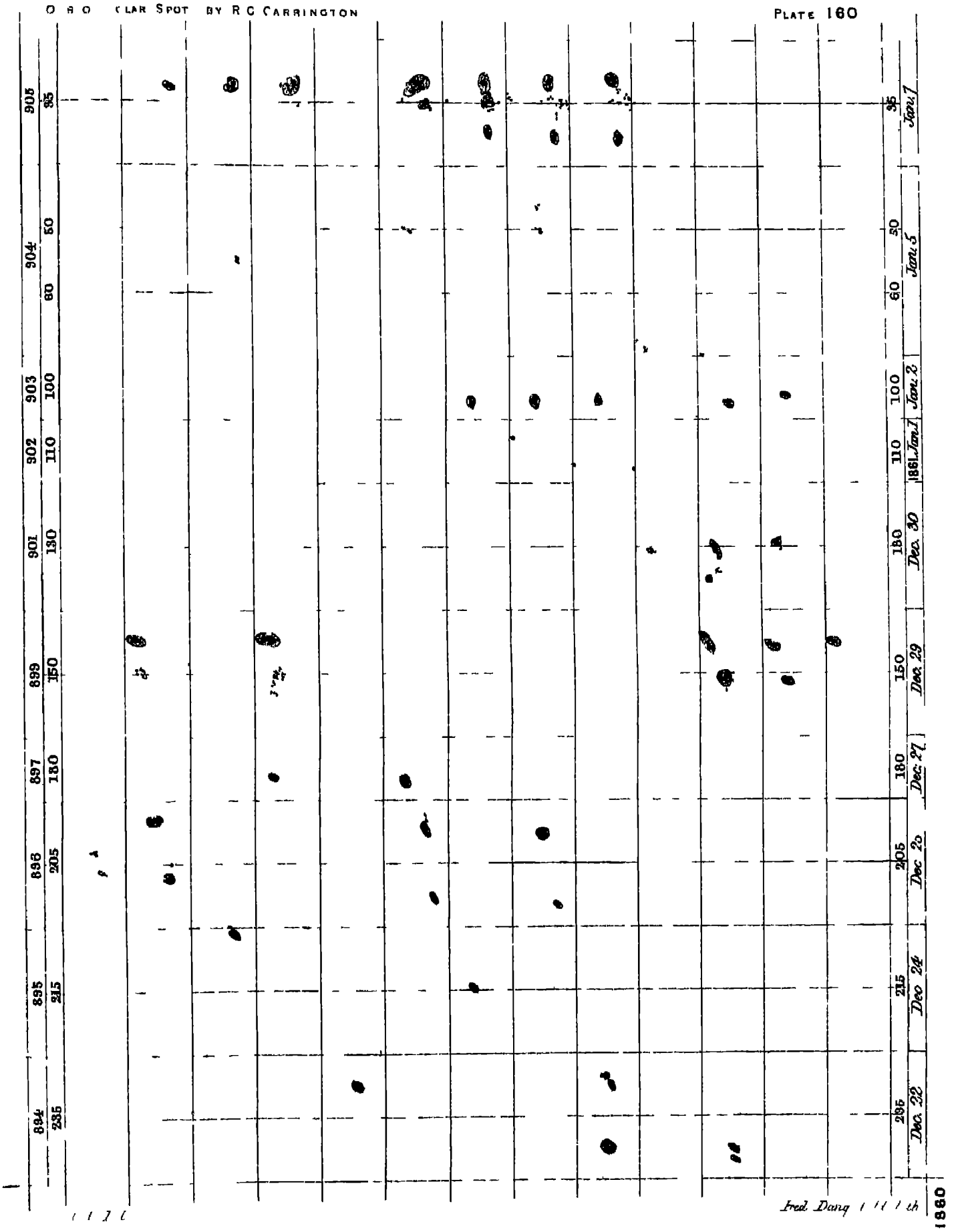
Plate 158




888 90
889 60
890 55
891 30 20
892 340
893 340
894 340 320
895 285
896 260
897 260
Dec. 6
Dec. 8
Dec. 9
Dec. 11
Dec. 14
Dec. 14
Dec. 14
Dec. 16
Dec. 18
Dec. 20
Dec. 20

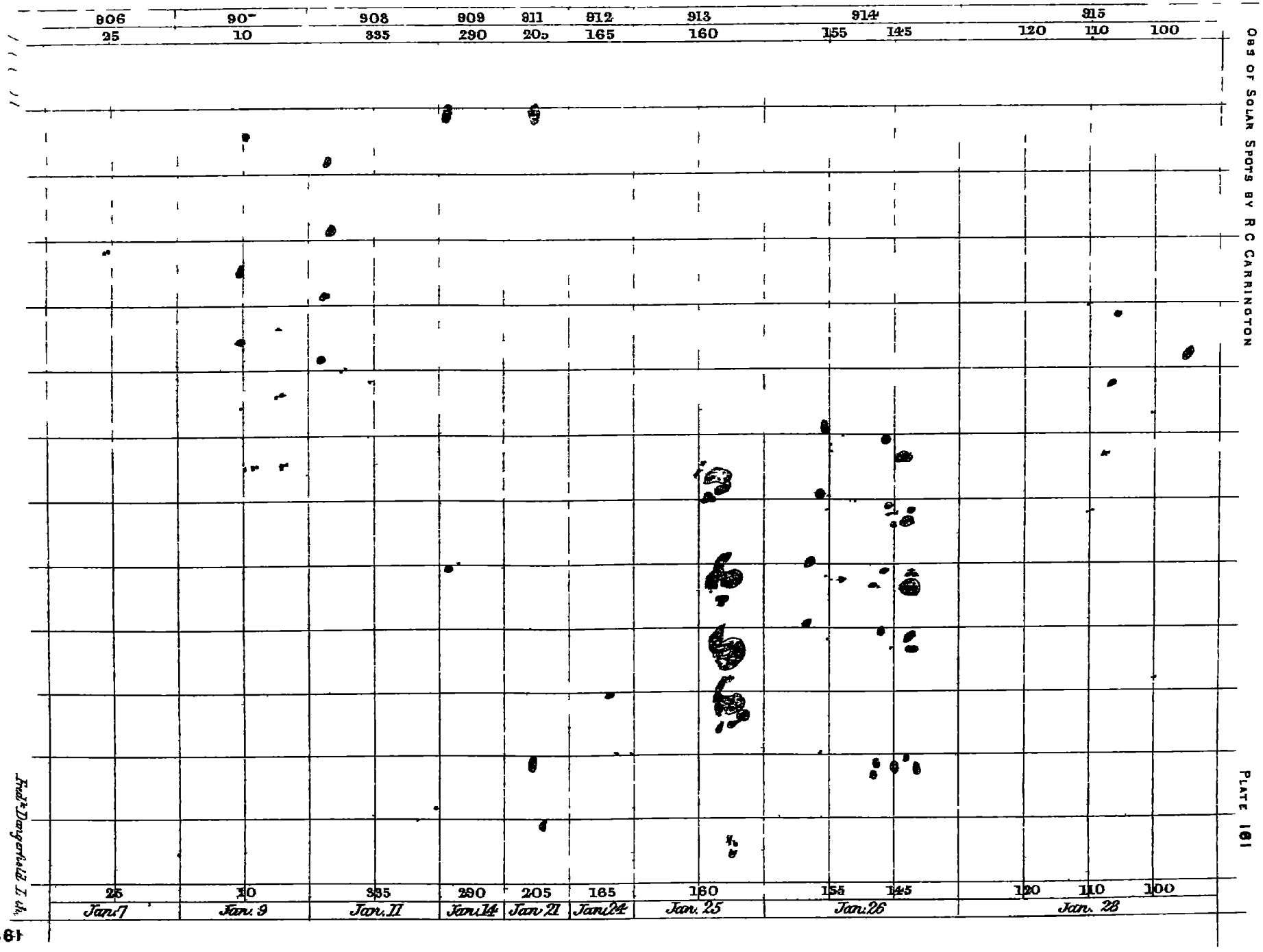
O B O CLAR SPOT BY R C CARRINGTON

PLATE 160



Fred Dang

1860

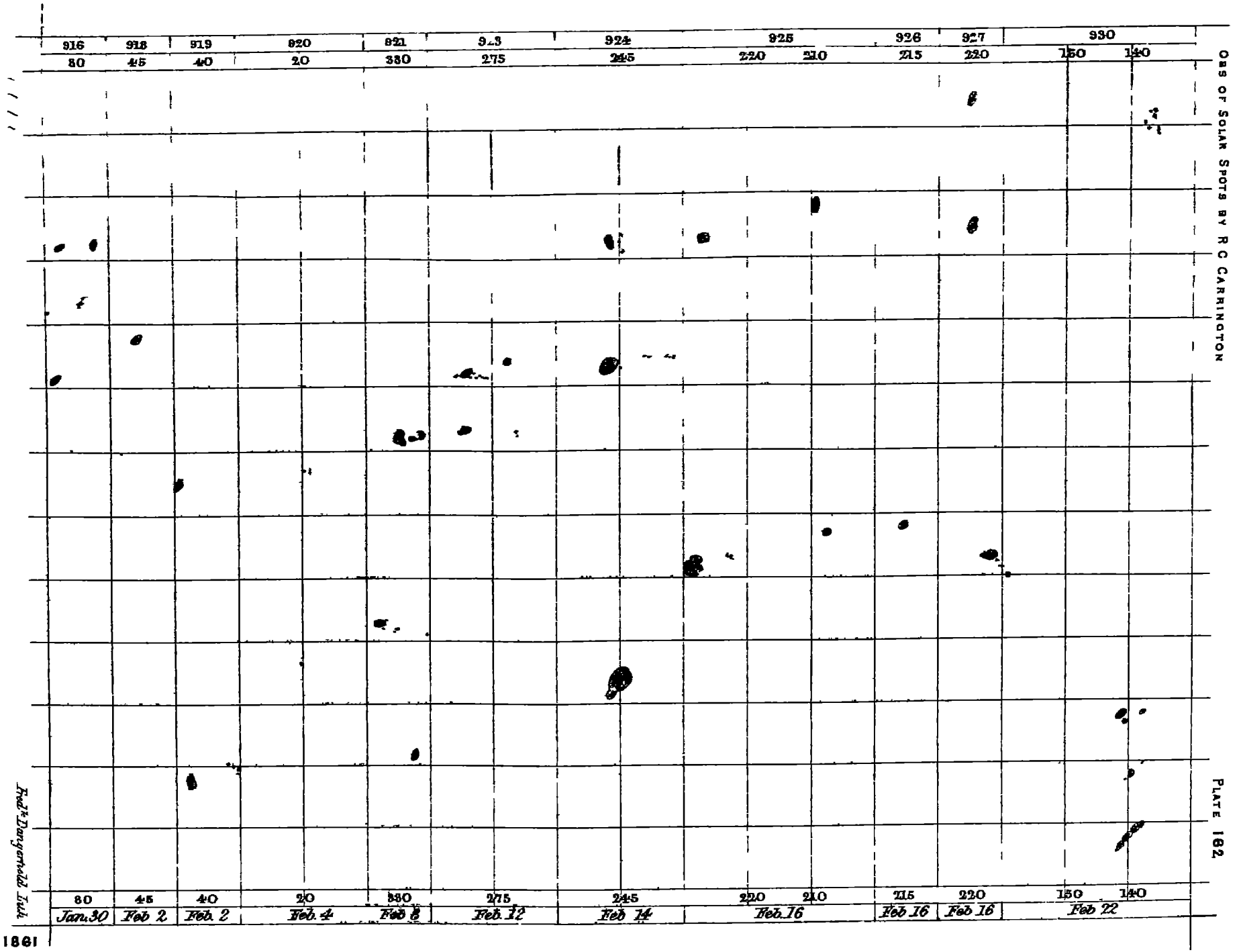


OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 161

Fred'k Dangerfield I. th.

1861

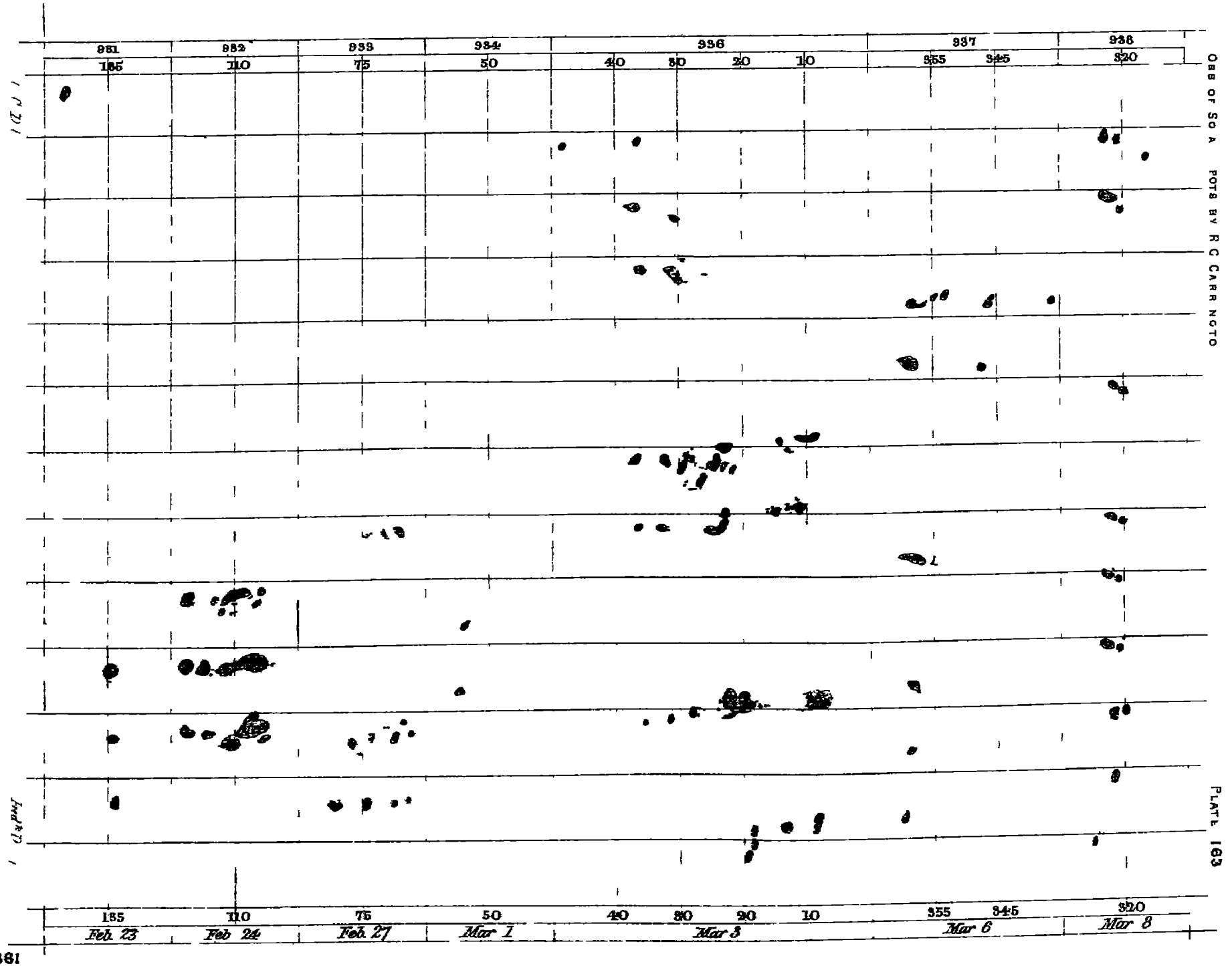


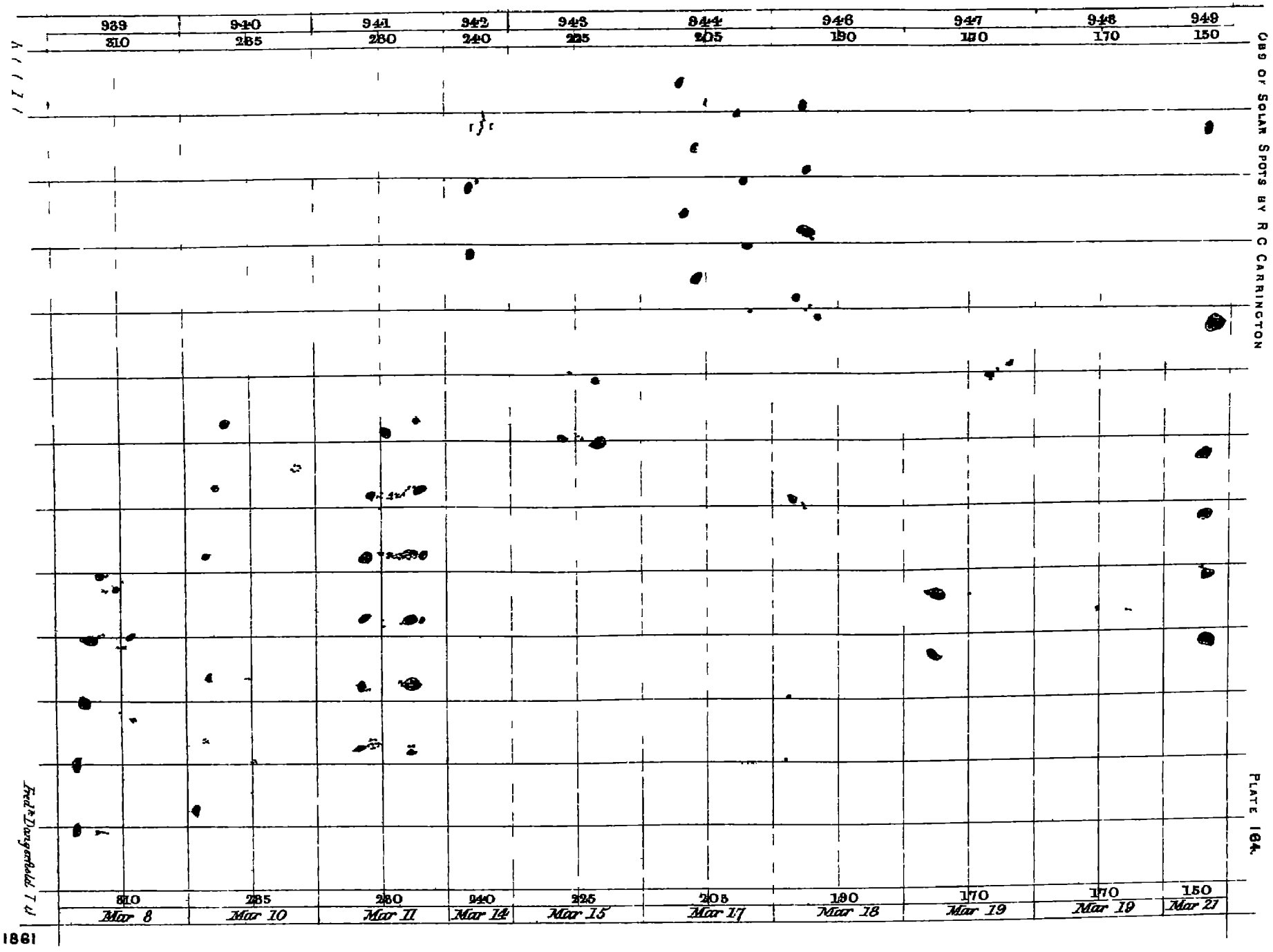
OBS OF SOLAR SPOTS BY R C CARRINGTON

PLATE 182

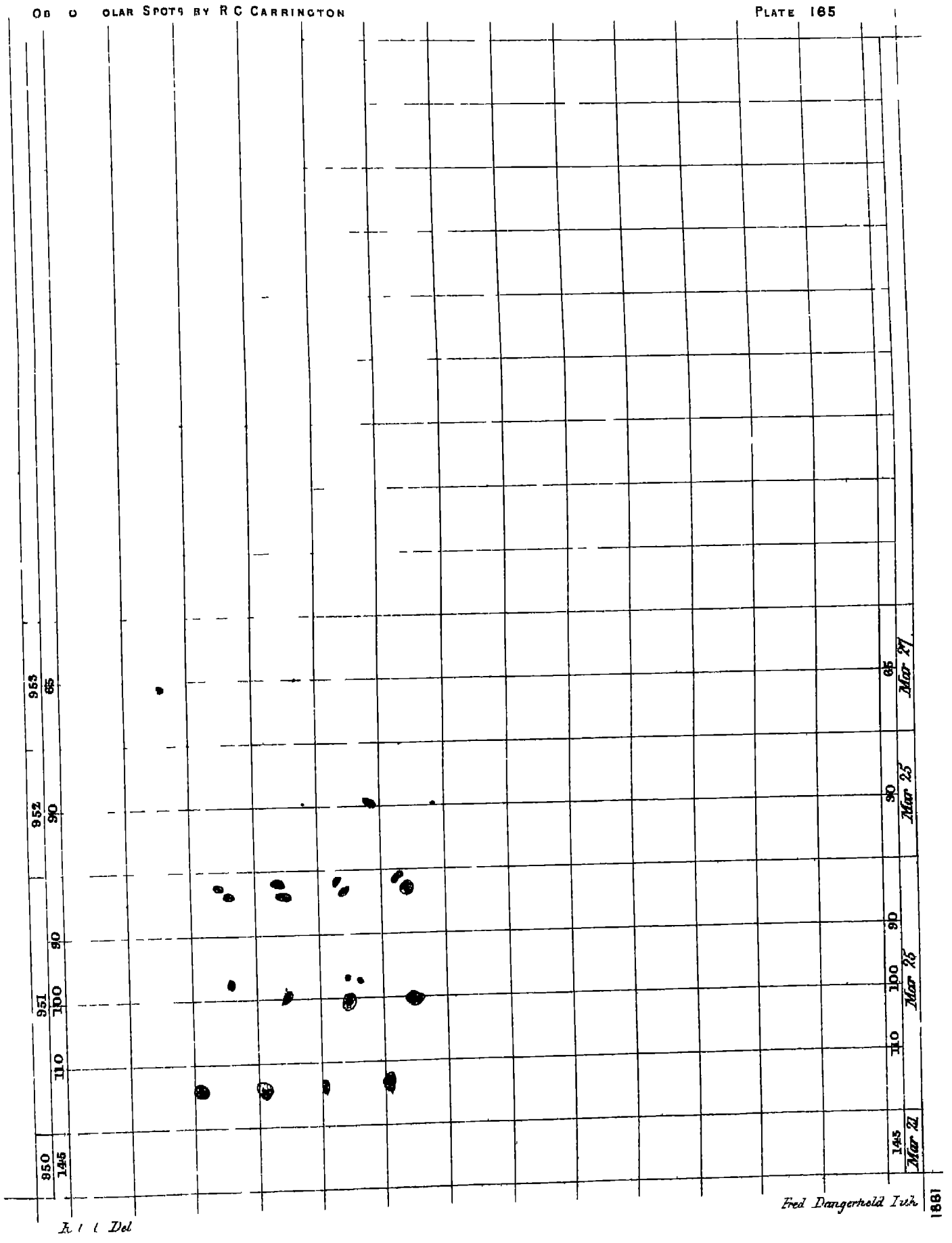
Fred'k Dangerfield Lith

1861


931 932 933 934 936 937 938
185 110 75 50 40 30 20 10 355 345 320
185 110 75 50 40 30 20 10 355 345 320
Feb. 23 Feb. 24 Feb. 27 Mar 1 Mar 3 Mar 6 Mar 8
OBS OF SO A SPOTS BY R C CARRINGTO
PLATE 163
1861



Obs of Solar Spots by R C Carrington

Plate 164.

Observations of Solar Spots by R C Carrington